

In This Issue—*Analysis of Farmers' Truck Needs*

Engineering  
Library

APR 15 1921

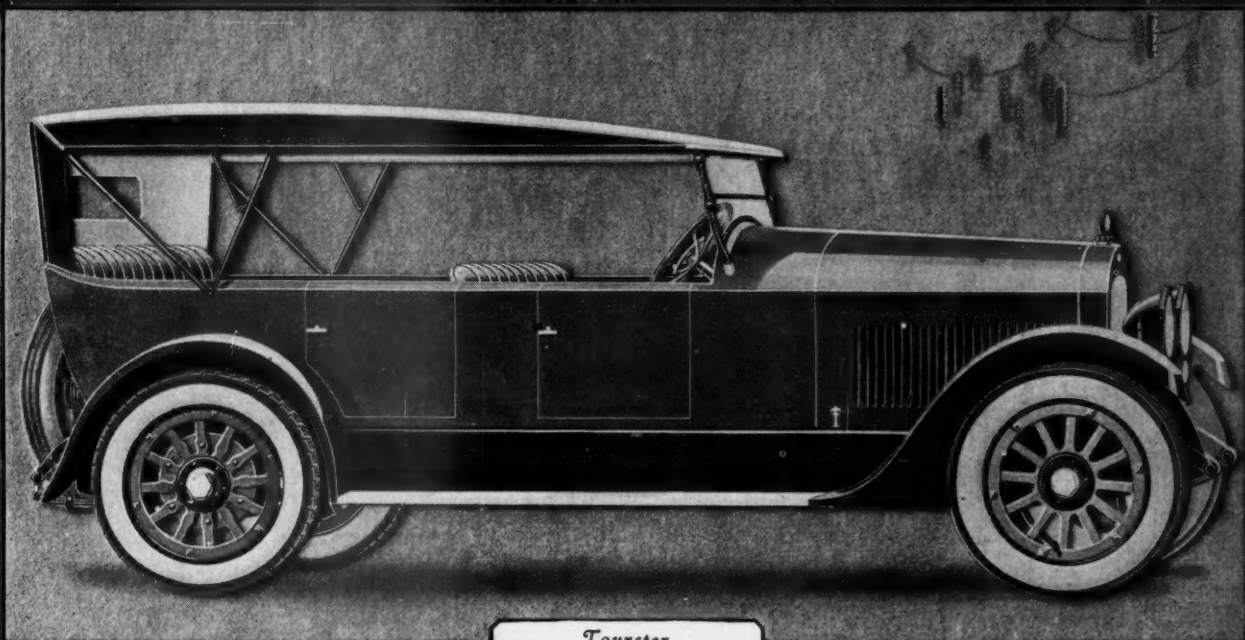
# MOTOR AGE

Vol. XXXIX  
Number 15

PUBLISHED WEEKLY AT THE MALLERS BUILDING  
CHICAGO, APRIL 14, 1921

Thirty-five Cents a Copy  
Five Dollars a Year

THERE'S A TOUCH OF TOMORROW IN ALL COLE DOES TODAY



Tourster

## Cole Aero-EIGHT

If beauty is the chief requirement the *Cole Aero-EIGHT* meets with the instant approval of the connoisseur. If economy is stressed the high average tire



mileage of 15,000 miles with a correspondingly low fuel consumption of 12 to 14 miles per gallon of gasoline is sufficient evidence for the most exacting.

COLE MOTOR CAR COMPANY, INDIANAPOLIS U. S. A.

*Creators of Advanced Motor Cars*

# Restores Power in Old Motors

## NO-LEAK-O Supremacy—

### Reason No. 1

The original patented non-clogging, oil sealing groove insures perfect lubrication, prevents leakage due to warped, worn and imperfect cylinders—restores power in old motors—not a mere oil scraping groove.

## Other Reasons For NO-LEAK-O Supremacy

Made in one piece—individually cast—concentric.

Quick seating—snug fitting—easy to install.

Non-leaking—gas and oil tight—perfect compression.

Equalized pressure on cylinder walls, the result of a patented casting process.

Finest material—guaranteed against breakage.

The perfect oil seal means less smoke less carbon—cleaner spark plugs—lower gas and oil consumption—a longer wearing, smoother running engine.

Keeps coal oil out of oil pit and away from crank shaft bearings.

Simplicity of construction—high efficiency—low cost—backed by world's largest piston ring plant.

Seven years of success. An idea in 1913—a million a month in 1920. Why? They make good.

All sizes to fit any make of engine for motor car, truck, tractor, and motor boat.



THE ONLY GROOVE THAT CANNOT CLOG

100% Perfect—Price 50c and Up.

Insert on the standard NO-LEAK-O package as shown below—bearing the ring and seal which constitutes our trade mark as registered in the United States Patent Office.

Patents allowed—be ware of infringements.



### DEALERS AND JOBBERS

NO-LEAK-O is the best jobbers and dealers proposition because the price is popular and the results so superior to other higher priced rings, that they bring repeat orders and more customers. If you do not sell NO-LEAK-O Piston Rings write for descriptive printed matter and wholesale proposition to jobbers. Now handled by over 200 leading jobbers in United States and Canada. Attractive window trims, display hangers and electrots furnished.

# NO-LEAK-O *Piston Rings*

NO-LEAK-O PISTON RING COMPANY 824 W. NORTH AVE., BALTIMORE, MD.



# MOTOR AGE

Published Every Thursday by

THE CLASS JOURNAL COMPANY

MALLERS BUILDING

59 East Madison Street, CHICAGO

HORACE M. SWETLAND, Pres. W. I. RALPH, Vice-Pres.  
E. M. COREY, Treas. A. B. SWETLAND, Gen. Mgr.

Member Audit Bureau of Circulations; Member Assoc. Business Papers, Inc.

Vol. XXXIX

APRIL 14, 1921

No. 15

## CONTENTS

An Analysis of the Farmer's Truck Needs Based on Actual Experience.....	7
The Progress of Labor Saving, Time Saving Repair Equipment .....	12
How the Electrical System Works.....	14
Couldn't Hold Show?—Denver Does.....	17
How to Burn in Bearings.....	18
Shortage of Fuel and Lower Gravity Will Dictate Future Changes in Engine Design	19
News of the Industry.....	23 to 33

### Descriptions of New Developments

Four-Wheel Brake Ready for All Cars.....	20
Non-Glare Headlights Now Standard Equipment on Fords.....	21

## DEPARTMENTS

Better Business .....	34
Automotive Architecture .....	36
The Readers' Clearing House.....	38
The Accessory Show Case.....	44
Service Equipment .....	45
Law in Your Business.....	46
The Automotive Repair Shop.....	47
Passenger Car Serial Numbers.....	48
Weekly Wiring Chart.....	49
Specifications of Passenger Cars, Trucks and Tractors .....	50-51-52-53
Coming Motor Events.....	54

Index to Advertisers next to last page

## MOTOR AGE

MALLERS BUILDING  
CHICAGO

Phone Randolph 6960  
Cable Address "Motage"

E. E. HAIGHT, Manager

DAVID BEECROFT, Directing Editor

RAY W. SHERMAN, Executive Editor B. M. IKERT, Editor

### BRANCH OFFICES

DETROIT, 317 Fort St., W., Phone Maine 1351; CLEVELAND,  
536-540 Guardian Bldg., Main 6432; NEW YORK CITY, U. P. C.  
Bldg., 239 W. 39th St., Phone Bryant 8760; PHILADELPHIA,  
Widener Bldg., Phone Locust 342-343; BOSTON, 185 Devon-  
shire St. Phone 4336 Ft. Hill.

SUBSCRIPTION RATES	
United States, Mexico and U. S. Possessions.....	\$ 5.00 per year
Canada.....	7.00 per year
All Other Countries in Postal Union.....	10.00 per year
Single Copies .....	35 cents

Make Checks Payable to Motor Age

Entered as second-class matter, September 19, 1899, at the  
Post Office, Chicago, Illinois, under Act of March 3, 1879.

Owned by UNITED PUBLISHERS CORPORATION, 239 W.  
39th St., New York, H. M. Swetland, Pres.; Charles S. Phil-  
lips, Vice-Pres.; A. C. Pearson, Treas.; Fritz J. Frank, Sec.

## What do you know about Automotive Electricity?

Make yourself master of the **one most important technical branch** of motor car repair work, and you rise above the lot of the mechanic.

Electrical problems are the most frequent and least understood of all motor car troubles. And the man who is able, **because of expert training**, to solve them intelligently and quickly, will find a bigger and better paying job awaiting him.

The N. Y. E. S. course fits you by **ACTUAL PRACTICE** to handle every kind of repair, replacement and installation job on every make of starting, lighting and ignition system known to the automotive industry. This includes farm lighting and power plants and airplane systems as well.

At the N. Y. E. S. you **LEARN BY DOING**. You learn electrical theories by **applying them**. You familiarize yourself with all auto electrical systems by **working on them**. An apt student can complete the course in ten weeks.

Learn the facts about the demand for electrically trained men. Tear off and mail this coupon for full information on the N. Y. E. S. automotive-electric course.

## THE NEW YORK ELECTRICAL SCHOOL

36 W. 17th Street  
New York

New York Electrical School,  
36 West 17th Street, New York.  
Send me prospectus and full details of course in automotive  
electricity and your "learn-by-doing" method.  
Name.....  
Address.....  
I am employed by.....

A CLEAN, sweet-running motor never belches forth a cloud of smoke and carbon—poor fuel and bad oils soon foul a good motor which is evidenced by volumes of black smoke from the exhaust.

SUPREME AUTO OIL is a clean, straight-run petroleum product, made especially for the automobile motor. Its use will minimize carbon and induce a maximum power under the hood.

*At The Sign Of The Orange Disc*

## GULF REFINING COMPANY

General Sales Offices:  
Pittsburgh, Pa.

### District Sales Offices:

New York  
Atlanta

Philadelphia  
New Orleans

Boston  
Houston

*Dealer Inquiries Solicited*





# MOTOR AGE



## An Analysis of the Farmer's Truck Needs Based on Actual Experience

*This Wealth of Truck Information, Compiled by the Government, Is Perhaps the Most Valuable and Comprehensive Work Done So Far to Help Analyze the Farmer's Truck Needs—Dealers Will Find It Invaluable*

### Truck Experience

**I**N the past the automotive dealer has been woefully lacking the right kind of figures with which to convince the farmer of the economy of the motor truck and the size truck needed for certain conditions. **MOTOR AGE** in this article tells of the experience of eastern farmers with motor trucks. It is an analysis of 753 reports from farmer truck-owners compiled by H. R. Tolley, Scientific Assistant, and L. M. Church, Assistant in Farm Accounting of the U. S. Department of Agriculture.

**T**HIS truck data is based on the experience with motor trucks of 753 farmers in the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware and Maryland who have motor trucks for use on their farms.

These farms are of all sizes and types and the motor trucks used on them are of all sizes from  $\frac{1}{2}$  ton to 5 tons. The rated capacity of very few of the trucks is over 2 tons, however, and nearly half are of the 1-ton size.

Only 18 per cent of these farms are less than 5 miles from market, and nearly one-fourth are 20 miles or more from market.

Ninety-five per cent of these men believe that their trucks will prove to be profitable investments.

One-ton trucks are preferred by more of them than prefer

## *MOTOR AGE Recommends That This Series, Which Will Be Completed in Four Issues, Be Saved and Referred to When Deciding Which Truck Is Best Suited to the Farmer's Requirements.*

any other size. About half of the owners of  $\frac{1}{2}$ - and  $\frac{3}{4}$ -ton trucks prefer sizes larger than they now own.

In the opinions of these men the principal advantage of a motor truck is in saving time, and the principal disadvantage is "poor roads."

As compared with horses and wagons, the trucks save from half to two-thirds of the time required for hauling materials to and from the farms.

These men have return loads for their trucks on about one-fourth of the trips.

A majority still use their horses for some road hauling. On most of the farms all the hauling in the fields and around the buildings is done with horses and wagons.

About one-fourth of these men do some custom hauling with their trucks. The average amount received per year by those who do such work is \$174.

On the average there are about eight weeks during the year when the roads are in such condition on account of mud, snow, etc., that the trucks can not be used. Three-fourths of them usually travel on roads that are all or part dirt.

About one-fourth of the men have changed their markets, for at least a part of their produce, since purchasing trucks. For those who have changed market, the average distance to the old market is 7 miles, and the average distance to the new market is 20 miles.

According to owners' estimates, each of these trucks travels an average of 3,820 miles per year and is used on 173 days per year.

The average estimated life of the trucks is between  $6\frac{1}{2}$  and 7 years, and, in most cases, depreciation is the largest single item of expense.

Most of the owners of the  $\frac{1}{2}$ -ton and  $\frac{3}{4}$ -ton trucks prefer pneumatic tires, the owners of the 1-ton trucks are about evenly divided in their preference, but most of the owners of trucks larger than 1 ton prefer solid tires.

Over two-thirds of these trucks had not been out of commission, when needed, for a single day during the year covered by the reports, and nearly the same proportion of the owners stated that they had not lost any appreciable time on account of motor and tire trouble, breakage, etc., when using their trucks. However, about one truck in thirty had been out of commission 10 days or more.

The average cost of operation of the  $\frac{1}{2}$ -ton trucks was about 8 cents per mile; of the  $\frac{3}{4}$ -ton trucks about 13 cents; of the 1-ton about 12 cents; of the  $1\frac{1}{4}$ -ton and  $1\frac{1}{2}$ -ton about 19 cents, and of the 2-ton about 20 cents.

The average cost of hauling crops, including the value of the driver's time at 50 cents an hour, was about 50 cents per ton-mile with the  $\frac{1}{2}$ -ton trucks, 34 cents with the  $\frac{3}{4}$ -ton, 26 cents with the 1-ton, 24 cents with the  $1\frac{1}{4}$ -ton and  $1\frac{1}{2}$ -ton, and 18 cents with the 2-ton trucks.

About four-fifths of these men state that their trucks have hired help. On the average they estimate that this saving amounts to \$324 per year.

About half the men have decreased the number of work stock by at least one head since purchasing their trucks. Less than one man in ten had disposed of more than two head, however.

Over half of the men whose farms contain more than 120 crop-acres own tractors. The number of work stock kept on the farms where both trucks and tractors are owned is only slightly less than the number kept on the farms of corresponding size where only trucks are owned.

### METHOD OF STUDY

In December, 1919, the crop reporters of the Bureau of Crop Estimates were asked to report the names and addresses of farmers who owned motor trucks for farm use. Nine thousand six hundred and fifty-nine names and addresses of farmers in the 11 States included in the study were received, and to each was sent a questionnaire on which to report the type and size of his farm, the use he makes of his motor truck, the cost of

operating it, his idea of its profitableness, the advantages and disadvantages of a truck for farm use, and other related information. In all, 2,314, about 24 per cent of the farmers queried, replied to the questionnaire.

However, no reports from men owning second-hand trucks nor trucks made by the addition of truck units or attachments to passenger cars, were included in the study. Twenty-seven per cent of the reports were on machines of these classes. About 10 per cent of the reports were from men who had owned their trucks only six months or less, and they were also excluded. Another 30 per cent of the reports were excluded for other reasons. Some were from farmers who are using their trucks primarily for custom work, or in connection with other business, and only incidentally for farm work; some were from men who had sold their trucks; and a few of the reports were not filled out in sufficient detail to make their use worth while. The questionnaire called for information on over 150 items.

### LOCATION OF FARMS AND TYPES OF FARMING

The number of reports tabulated from each State follows:

Maine .....	11	New York.....	241
New Hampshire.....	11	New Jersey.....	92
Vermont .....	16	Pennsylvania .....	235
Massachusetts .....	63	Delaware .....	11
Rhode Island.....	16	Maryland .....	40
Connecticut .....	17		

These farms are of all sizes and types, varying from truck farms of only a few acres to large crop farms containing several hundred acres. The types of farming practiced have been classified into five groups, as follows:

- (1) Truck farms, on which the raising of vegetables and similar produce predominates.
- (2) Dairy farms, on which dairying is the principal enterprise.
- (3) Fruit farms.
- (4) Crop farms, on which general field crops are raised, but few or no dairy cows are kept, and no livestock is raised for sale.
- (5) General farms, where no one special enterprise predominates.

In the region studied there are many more general farms than any other type. Although more reports were received from men who operate general farms than from any other class, this does not necessarily mean that the percentage of such farmers who own motor trucks larger than that of men who follow special types of farming.

The number of farms of the different types and their average size are shown in Table 1.

TABLE I.—Number of farms of different types, and their acreages.

Type of farm	Number	Average size.
Truck.....	149	64
Dairy.....	129	234
Fruit.....	113	111
Crop.....	48	237
General.....	314	210
All.....	753	173

### DISTANCE TO MARKET

Probably the most striking point concerning these farms is their great distance from market as compared with other farms in the same section. Only 18 per cent of these farms are less than 5 miles from market, while nearly one-fourth of them are 20 miles or more. As will appear later, some of the men who have very long hauls have changed their markets since purchasing their trucks, but the average distance from market, even before the purchase of the trucks, was a little over 10 miles.



Seven hundred and four men reported the distance to the towns where the materials hauled by trucks are usually marketed. The exact number of farms of different types at different distances from market is as follows:

Of 143 truck farms—

- 11 are less than 5 miles from market.
- 32 are from 5 to 9 miles from market.
- 34 are from 10 to 14 miles from market.

Of 143 trucks farms—

- 33 are from 15 to 19 miles from market.
- 17 are from 20 to 24 miles from market.
- 9 are from 25 to 29 miles from market.
- 7 are 30 miles and over from market.

Of 117 dairy farms—

- 48 are less than 5 miles from market.
- 45 are from 5 to 9 miles from market.
- 8 are from 10 to 14 miles from market.
- 2 are from 15 to 19 miles from market.
- 7 are from 20 to 24 miles from market.
- 4 are from 25 to 29 miles from market.
- 3 are 30 miles and over from market.

Of 98 fruit farms—

- 18 are less than 5 miles from market.
- 21 are from 5 to 9 miles from market.
- 16 are from 10 to 14 miles from market.
- 10 are from 15 to 19 miles from market.
- 9 are from 20 to 24 miles from market.
- 9 are from 25 to 29 miles from market.
- 15 are 30 miles and over from market.

Of 44 crop farms—

- 11 are less than 5 miles from market.
- 15 are from 5 to 9 miles from market.
- 4 are from 10 to 14 miles from market.
- 4 are from 15 to 19 miles from market.
- 4 are from 20 to 24 miles from market.
- 1 is from 25 to 29 miles from market.
- 5 are 30 miles and over from market.

Of 302 general farms—

- 36 are less than 5 miles from market.
- 67 are from 5 to 9 miles from market.
- 68 are from 10 to 14 miles from market.
- 57 are from 15 to 19 miles from market.
- 22 are from 20 to 24 miles from market.
- 23 are from 25 to 29 miles from market.
- 29 are 30 miles and over from market.

Of all the 704 farms—

- 18 per cent are less than 5 miles from market.
- 25 per cent are from 5 to 9 miles from market.
- 19 per cent are from 10 to 14 miles from market.
- 15 per cent are from 15 to 19 miles from market.
- 8 per cent are from 20 to 24 miles from market.
- 7 per cent are from 25 to 29 miles from market.
- 8 per cent are 30 miles and over from market.

The distances from market of more than 4,000 farmers in these States, as shown by farm survey records, indicate that only a small percentage of all the farms in this section are more than 10 miles from market. The average distance from market of 4,271 farms is 4.1 miles, and the number at different distances is as follows:

- 2,936, or 68.7 per cent, are less than 5 miles from market.
- 1,018, or 23.8 per cent, are from 5 to 9 miles from market.
- 241, or 5.7 per cent, are from 10 to 14 miles from market.
- 51, or 1.2 per cent, are from 15 to 19 miles from market.
- 25, or 0.6 per cent, are 20 miles and over from market.

### SIZE OF TRUCK

The motor trucks owned on these 753 farms are of many sizes, their rated capacities running from  $\frac{1}{2}$  ton to 5 tons. However, these men use more 1-ton trucks than any other size, and only a little more than 2 per cent of the total number are rated at more than 2 tons. The number of the different sizes on the farms of different types is as follows:

On the 149 truck farms, there are—

- 24  $\frac{1}{2}$ -ton trucks.
- 18  $\frac{3}{4}$ -ton trucks.
- 59 1-ton trucks.

(Continued in next column at left)

are—

- 43  $\frac{1}{2}$ -ton trucks.
- 14  $\frac{3}{4}$ -ton trucks.
- 62 1-ton trucks.

(Continued in next column at right)

- 19  $1\frac{1}{4}$ - and  $1\frac{1}{2}$ -ton trucks.
- 22 2-ton trucks.
- 7 over 2 tons.

On the 113 fruit farms, there are—

- 17  $\frac{1}{2}$ -ton trucks.
- 17  $\frac{3}{4}$ -ton trucks.
- 48 1-ton trucks.
- 11  $1\frac{1}{4}$ - and  $1\frac{1}{2}$ -ton trucks.
- 18 2-ton trucks.
- 2 over 2 tons.

On the 314 general farms, there are—

- 65  $\frac{1}{2}$ -ton trucks.
- 41  $\frac{3}{4}$ -ton trucks.
- 156 1-ton trucks.
- 22  $1\frac{1}{4}$ - and  $1\frac{1}{2}$ -ton trucks.
- 24 2-ton trucks.
- 6 over 2 tons.

- 4  $1\frac{1}{4}$ - and  $1\frac{1}{2}$ -ton trucks.
- 4 2-ton trucks.
- 2 over 2 tons.

On the 48 crop farms, there are—

- 1  $\frac{1}{2}$ -ton truck.
- 5  $\frac{3}{4}$ -ton trucks.
- 19 1-ton trucks.
- 11  $1\frac{1}{4}$ - and  $1\frac{1}{2}$ -ton trucks.
- 11 2-ton trucks.
- 1 over 2 tons.

### AGE OF TRUCKS

The length of time the 753 trucks had been in use at the time the reports were made is as follows:

- 201 had been in use 7 to 12 months.
- 269 had been in use 13 to 24 months.
- 164 had been in use 25 to 36 months.
- 119 had been in use 37 months or over.

### ARE THESE TRUCKS PROFITABLE INVESTMENTS?

No attempt was made to determine to what extent the incomes of these men had been increased through the use of the trucks, but 95 per cent of the total number stated that in their opinion their machines bid fair to be profitable investments. So far as could be determined, the size of the truck, the type of farming practiced, and length of time the machine had been owned had little to do with the owner's idea of its profitability. Some of those who did not consider that their motor trucks had been profitable were men who had found them unreliable, as they were often out of commission when needed, or their repair bills had been exceptionally high. Others had found that they did not have enough work for the truck to justify the investment in such an expensive piece of equipment.

### THE BEST SIZE

The fact that most of these men consider their motor trucks profitable investments does not mean, however, that they are all entirely satisfied with the particular machines which they own. It is very important that the truck should be of the proper size for the hauling which it is to do. Ordinarily both the first cost and the cost of operation of a small truck will be less than of a large one, but often the small truck will not carry as large loads as is desired, and more trips to haul a given amount of material will therefore be necessary than with a larger truck. A truck which is too large, however, would have to be operated with only a partial load a great part of the time, and the extra cost would more than offset the advantage of being able to carry larger loads on exceptional occasions.

Each farmer was asked to state what size he considers the best for his conditions, regardless of the size he now owns, and 696 men answered as follows:

Of 131 who now own  $\frac{1}{2}$ -ton trucks—

- 47 consider that the best size is  $\frac{1}{2}$ -ton.
- 14 consider that the best size is  $\frac{3}{4}$ -ton.
- 56 consider that the best size is 1-ton.
- 9 consider that the best size is  $1\frac{1}{4}$ - or  $1\frac{1}{2}$ -ton.
- 4 consider that the best size is 2-ton.
- 1 considers that the best size is over 2-ton.

Of 83 who now own  $\frac{3}{4}$ -ton trucks—

- 1 considers that the best size is  $\frac{1}{2}$ -ton.
- 46 consider that the best size is  $\frac{3}{4}$ -ton.
- 28 consider that the best size is 1-ton.
- 6 consider that the best size is  $1\frac{1}{4}$ - or  $1\frac{1}{2}$ -ton.
- 1 considers that the best size is 2-ton.
- 1 considers that the best size is over 2-ton.

Of 329 who now own 1-ton trucks—

- 2 consider that the best size is  $\frac{3}{4}$ -ton.
- 242 consider that the best size is 1-ton.
- 54 consider that the best size is  $1\frac{1}{4}$ - or  $1\frac{1}{2}$ -ton.
- 30 consider that the best size is 2-ton.
- 1 considers that the best size is over 2-ton.

- Of 63 who now own  $1\frac{1}{4}$ - and  $1\frac{1}{2}$ -ton trucks—  
 2 consider that the best size is 1-ton.  
 39 consider that the best size is  $1\frac{1}{4}$ - or  $1\frac{1}{2}$ -ton.  
 19 consider that the best size is 2-ton.  
 3 consider that the best size is over 2-ton.
- Of 77 who now own 2-ton trucks—  
 1 considers that the best size is 1-ton.  
 5 consider that the best size is  $1\frac{1}{4}$ - or  $1\frac{1}{2}$ -ton.  
 59 consider that the best size is 2-ton.  
 12 consider that the best size is over 2-ton.
- Of 13 who now own  $2\frac{1}{2}$ -ton and over—  
 2 consider that the best size is 2-ton.  
 11 consider that the best size is over 2-ton.
- In all—  
 48 consider that the best size is  $\frac{1}{2}$ -ton.  
 62 consider that the best size is  $\frac{3}{4}$ -ton.  
 329 consider that the best size is 1-ton.  
 113 consider that the best size is  $1\frac{1}{4}$ - or  $1\frac{1}{2}$ -ton.  
 115 consider that the best size is 2-ton.  
 29 consider that the best size is over 2-ton.

There has evidently been a tendency on the part of some of these men to purchase trucks which experience has shown to be too small for their needs. While 444, or 64 per cent, prefer the size they now own, only 13 of the entire number prefer smaller sizes and 239 prefer larger sizes. However, the 1-ton size is preferred by nearly three times as many men as any other size, and only about 1 man in 25 prefers a truck of over 2 tons capacity.

#### ADVANTAGES AND DISADVANTAGES

There are advantages in the ownership of a motor truck, but just how great these advantages are and which should be given the greatest weight are questions unanswerable by the man who has not had experience with a truck. Summary of the answers of 638 of these truck owners to the question "What is the principal advantage of a truck for farm use?" is given in Table II.

TABLE II.—The "principal advantage" of a motor truck as reported by 638 farmers.

Principal advantage.	Number reporting.	Per cent of total.
Time saved.....	577	91
Saves horses.....	19	3
Better market.....	15	2
Convenience.....	13	2
Reduces expense.....	9	1
Other.....	5	1
Total.....	638	

More than 90 per cent of the owners believe that time saving is the principal advantage. There are other advantages, of course, but in the minds of these farmers this is the principal one. While only 15 of the men report that the principal advantage of the truck is that it enables them to go to a better market, a much larger number are going to a better market now than before the purchase of their trucks. Going to a market which is farther from their farms is simply a matter of taking more time for marketing, and part of the men who say that saving time is the principal advantage find that the truck saves them sufficient time to enable them to go to the better market.

The fact that such a small number consider the saving of horses, the reducing of expense, and added convenience as the principal advantages of the truck, indicates that the amount of time which the motor truck will save, which may incidentally result in reaching a better market, is the item which should be given paramount importance when considering the purchase of a motor truck.

Disadvantages of the motor truck were reported by 283 men. (See Table III.) Of the remaining 470 farmers 297 did not answer the question and 173 stated that they knew of no disadvantages in owning a truck.

It is seen that "poor roads" was given as the principal disadvantage by 59 per cent of those who reported on this item. A large percentage of the reports stated that there is some

TABLE III.—The "principal disadvantage" of a motor truck as reported by 283 farmers.

Principal disadvantage.	Number reporting.	Per cent of total.
Poor roads.....	168	59
Cost of operation.....	48	17
Soft ground.....	25	9
First cost.....	15	5
Incompetent driver.....	14	5
Mechanical trouble.....	8	3
Other.....	5	2
Total.....	283	

time during the year when the roads are in such a condition that motor trucks can not be used. The men who live on unimproved roads, of course, have the greatest handicap in this respect, but even the best of roads may be impassable for a truck because of snow at certain times of the year in the region in which this study was made. After poor roads, either the cost of operation or soft ground is considered the greatest disadvantage, 17 per cent giving the cost of operation and 9 per cent soft ground as the greatest disadvantage. First cost is next in importance, 5 per cent considering it the most serious disadvantage, and trouble due to incompetent drivers and mechanical defects are considered prime disadvantages by 8 per cent of the owners.

#### ROAD HAULING WITH TRUCKS

All materials hauled to and from the farms were divided into five general classes, viz, "Crops," "Milk," "Feed," "Fertilizer" (including lime and manure), and "Other." An idea of the relative amounts of these different classes of material hauled by the trucks may be obtained from the fact that 444 farms reported hauling a total of 52,977 tons of crops during the year; 100 reported hauling a total of 10,371 tons of milk; 96 reported hauling a total of 2,847 tons of feed; 118 reported hauling 6,487 tons of fertilizer; and 159 farmers reported hauling 14,599 tons of other material. The character of the crops to be hauled depends, of course, upon the type of farming practiced. All the crops raised on the different types of farms represented in this study are included.

Each farmer reported the size of load, length of haul, and the time required for the round trip with the truck. Similar information was given for hauling with wagons before the purchase of trucks. The time required for the round trip included the time required for loading and unloading the truck or wagon.

Table IV shows a comparison of the size of load, length of haul, and time required for hauling crops with trucks of different sizes and with wagons.

TABLE IV.—Time required to haul crops with trucks, and with wagons before purchase of trucks (567 reports).

Size of truck.	With truck				With wagon.			
	Size of load.	Distance.	Hours per round trip.	Hours per ton-mile.	Size of load.	Distance.	Hours per round trip.	Hours per ton-mile.
	Pounds.	Miles.			Pounds.	Miles.		
$\frac{1}{2}$ -ton.....	960	10.4	2.5	0.50	1,505	9.0	7.2	1.06
$\frac{3}{4}$ -ton.....	1,851	12.9	3.2	.27	2,213	11.4	8.6	.68
1-ton.....	2,391	13.0	3.4	.22	2,582	10.4	8.3	.62
$1\frac{1}{4}$ to $1\frac{1}{2}$ -ton.....	3,469	10.1	2.8	.16	3,306	9.2	7.3	.49
2-ton.....	4,928	13.6	3.6	.10	4,488	12.9	9.5	.34
Over 2-ton.....	8,125	21.1	6.0	.07	5,783	19.7	13.8	.24

Table V gives a like comparison for hauling milk, Table VI for hauling feed, and Table VII for hauling fertilizer.

It will be seen that the men who are using the smaller trucks hauled comparatively small loads with their wagons; however, the average size of loads of crops hauled with the  $\frac{1}{2}$ -,  $\frac{3}{4}$ -, and 1-ton trucks is less than the average size of loads which were formerly hauled with wagons. The same is true with feed and fertilizer.



TABLE V.—Time required to haul milk with trucks, and with wagons before purchase of trucks (132 reports).

Size of truck.	With truck				With wagon.			
	Size of load.	Distance.	Hours per round trip.	Hours per ton-mile.	Size of load.	Distance.	Hours per round trip.	Hours per ton-mile.
	Pounds.	Miles.			Pounds.	Miles.		
1-ton	609	4.3	1.4	1.10	637	4.1	3.1	2.30
1-ton	1,264	7.9	2.6	.52	1,332	8.4	5.0	.90
1-ton	1,301	5.1	1.6	.48	1,309	4.9	3.6	1.12

TABLE VI.—Time required to haul feed with trucks, and with wagons before purchase of trucks (113 reports).

Size of truck.	With truck				With wagon.			
	Size of load.	Distance.	Hours per round trip.	Hours per ton-mile.	Size of load.	Distance.	Hours per round trip.	Hours per ton-mile.
	Pounds.	Miles.			Pounds.	Miles.		
1-ton	942	4.6	1.2	0.55	1,943	4.8	3.9	0.84
1-ton	1,555	6.6	1.8	.35	2,331	7.4	6.7	.75
1-ton	2,407	6.8	1.9	.23	2,824	5.7	4.8	.60
1½- to 1½-ton	3,214	5.6	1.8	.20	3,071	5.6	5.0	.59
2-ton	4,300	8.0	2.5	.14	3,300	7.8	7.0	.56

Table VII.—Time required to haul fertilizer with trucks, and with wagons before purchase of trucks (121 reports).

Size of truck.	With truck				With wagon.			
	Size of load.	Distance.	Hours per round trip.	Hours per ton-mile.	Size of load.	Distance.	Hours per round trip.	Hours per ton-mile.
	Pounds.	Miles.			Pounds.	Miles.		
1-ton	1,917	7.5	2.0	0.28	2,444	8.9	6.9	0.65
1-ton	2,444	7.3	2.3	.27	2,962	6.8	5.7	.56
1½- to 1½-ton	3,840	6.2	1.8	.15	3,681	6.1	4.5	.41
2-ton	5,281	7.2	2.2	.12	4,107	5.5	5.3	.47

Milk was hauled almost entirely with 1-ton trucks or smaller, only 7 of 139 men who reported hauling milk having trucks larger than 1 ton. The size of load is smaller and the distance hauled is shorter for milk than for the other three materials. For each size of truck the average distance crops are hauled is slightly greater than the distance hauled with the wagons before the trucks were purchased, this difference being due to the fact that a number of men changed their markets after buying their trucks.

The hours per ton-mile were arrived at by dividing the hours for the round trip by the product of the distance in miles and size of load in tons. For instance, in Table IV the ½-ton truck carrying a load of 960 pounds a distance of 10.4 miles accomplishes 4.99 ton-miles of hauling. Since 2½ hours are required for making this trip the time required per ton-mile is 0.50 hour. A comparison of the hours required per ton-mile for hauling by truck with the hours per ton-mile required for hauling by horses and wagon gives the proportion of the time saved by using the truck.

#### TIME SAVED BY TRUCKS

Table VIII shows the percentage of time which the trucks of different sizes are saving their owners in hauling different materials. In nearly every case the trucks are saving more than half of the time formerly required to haul with wagons.

If the men who own small trucks had hauled as large loads with wagons as the men with larger trucks did, the saving of time effected by the small trucks would have been much less. As shown in Table IV, the time per ton-mile required to haul crops with the ½-ton trucks is 0.50 hour, while the time required per ton-mile by these same men in hauling with wagons before the trucks were purchased was 1.06 hours, the trucks thus saving 53 per cent of the time. The men who now own

TABLE VIII.—Percentage of time which trucks of different sizes save in hauling different materials.

Size of truck.	Time saved in hauling.			
	Crops.	Milk.	Feed.	Fertilizer
	Per cent.	Per cent.	Per cent.	Per cent.
1-ton	53	52	35	57
1-ton	60	42	53	57
1-ton	65	57	62	52
1½- to 1½-ton	67	—	66	63
2-ton	71	—	75	75
Over 2-ton	71	—	—	—

1½- and 1½-ton trucks required only 0.49 hours per ton-mile for hauling with wagons before purchasing their trucks. This difference is due entirely to the fact that the men who now own ½-ton trucks formerly hauled loads with wagons which averaged 1,505 pounds, while the men owning 1½- and 1½-ton trucks hauled loads which averaged 3,306 pounds.

#### RETURN LOADS

The percentage of time which a truck is run without a load has a direct influence on the cost per unit of hauling with the truck. If a farmer can arrange to haul a load of produce to market and bring back a load of supplies to the farm on the same trip, he will reduce the time required and expense for hauling practically 50 per cent. The reports of these men show that they have loads both ways for their trucks on an average of about 26 per cent of their trips. Thirty per cent of the men, however, stated that they never have return loads. The dairy farmers and general farmers reported return loads a considerably larger percentage of the time than did the fruit, truck, and crop farmers.

#### ROAD HAULING FOR WHICH TRUCKS ARE NOT USED

A majority of these men still use their horses to supplement their trucks in hauling on the road. While 516 men reported concerning their present use of horses for road hauling, only 193, or 37 per cent, stated that they did all their road hauling during the year preceding the time of reporting with trucks. Table IX shows the reasons given by the remaining 323 of these 516 men for using their horses on the road.

Nearly one-half gave "poor roads" as the reason for using horses; that is, they found it necessary to use their horses for hauling which had to be done at times when the condition of the roads was such that their trucks could not be used. A majority of the remainder stated that they used their horses either because the truck was too light for the load which it was desired to haul, or because the body was unsuitable for carrying the material. However, no farmer with a truck larger than the 1-ton size stated that he used horses because the truck was too light. About 7 per cent of the total number said that they used their horses to help out when the truck was busy, and about an equal number said that since they must keep their horses anyway they used them for some road hauling when they were not busy at other work.

It was not possible to determine from the reports the exact proportion of the road hauling which is still done with horses on these farms. However, on a large majority of them horses were used only for road hauling which it was necessary to do at times when the trucks could not be used or for which the trucks were not suitable, and such hauling would amount to only about a small percentage of the total. The size of loads and distance hauled with horses are approximately the same as given in Tables IV to VII.

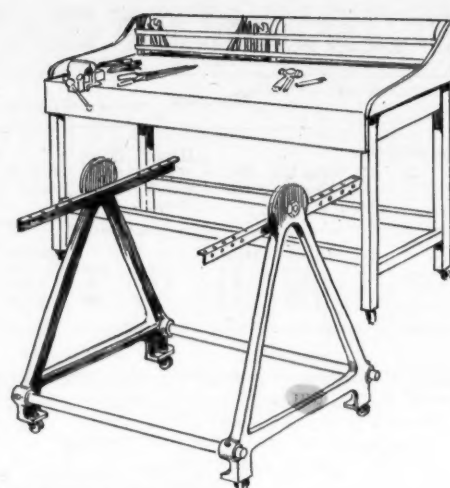
TABLE IX.—Reasons for using horses for hauling on the road.

Reason for using horses.	Number reporting.	Per cent of total.
Poor roads	146	45
Truck body unsuitable	40	15
Truck too light	47	15
Keep horses busy	24	7
Truck busy	22	7
Soft ground	5	2
Reduce expense	4	1
Other	26	8

*Labor Saving  
Time Saving*

## REPAIR EQUIPMENT

to Service 9,000,000 Motor Cars,  
Trucks and Tractors



*Great Progress Has Been Made in the Devices Designed to Make the Work of Servicing the Automotive Vehicle Easy and Profitable*

By B. M. Ikert

**T**HE rapid growth of the automotive industry in the last ten years has resulted in the establishment of another gigantic industry—the manufacture of automotive repair equipment.

In the early days of the automobile, repair work largely meant the application of tools like a wrench, hammer and screwdriver. In these days it was an accomplishment to travel twenty miles and back in a car and have all the cylinders firing at the end of the trip.

As cars became more efficient and increased in numbers, those engaged in the repair of automobiles and trucks soon found that hand work was too slow. It would never do if the vast number of vehicles, ever increasing in number, were to be kept in operation, and it was common in every shop to find mechanics trying to out-do one another in making devices of their own that would speed up repair operations.

Manufacturers of machine tools saw through it and all at once apparatus designed for the garage and service station exclusively, appeared on the market. In many cases the car and truck manufacturers built some of this special equipment to supplement that produced by the machine tool makers.

Today millions of dollars are invested in factories whose products go into the repairshop of the automotive industry. There is a general weeding out of the old methods everywhere and now the shop equipped with the same tools and machinery it used for blacksmithing is virtually out of the running.

The manufacturer of automobiles, trucks, or tractors is recognizing the repair situation as never before. The reason for this is simple: A car manufacturer who has spent thousands or even millions of dollars in tooling up a plant to make a good product is loth to see that product go out and be worked upon by shops of the hammer and monkey-wrench variety. It has become more and more the custom of the makers to insist that their service stations install equipment recommended by them,

or at least equipment from which good service can be had.

Labor-saving equipment in spite of its first cost will pay for itself in the long run. By labor-saving equipment we do not mean drill presses, lathes, etc., but the hundred and one things that come under the general head of service station equipment. Thus we have portable cranes by which one man can take an engine out of a car or truck and transfer it to an engine stand or bench.

There are devices for aligning pistons and connecting rods, reboring and aligning main bearings, instruments for testing the accuracy of crankshafts, etc., all with the thought of removing the human element in a repair job.

### MINIMIZING THE POSSIBILITY OF ERROR

Men may get tired on the job and slight an important operation in a hurry to get through. A tired mechanic cannot put forth his best efforts. A machine, on the other hand, never gets tired and will perform day in and day out with clock-like precision. Thus the more jobs we intrust to a machine the more unlikely is the shop to receive complaints from dissatisfied customers.

Naturally when it comes to buying anything one of the first thoughts in the minds of those who operate repairshops and service stations is: "Can we afford it and how much good is the purchase going to do us?" So it is quite natural to hear this from the lips of the automobile dealer, especially from the dealer running a small shop, when confronted with the problem of fitting out his shop with labor-saving devices. Before answering the question let us go on a little further and see what is required of the present day repairshop.

In the first place, the servicing or repairing of motor cars, trucks, and tractors is a business, the same as the manufacture of such vehicles. The dealer

who tools up his shop properly, or, in other words, installs labor-saving equipment to put his service work on a production basis, is the one who is going to cash in on his customers and get the proper backing from the manufacturer of the product he represents.

Manufacturers of automotive apparatus are insisting more and more that their service stations install labor-saving equipment. Mechanical clinics are being held from time to time by various concerns to show dealers and service men the value of time-saving machinery. As time goes on every repairshop will find it necessary to put in more labor-saving machinery to hold customers and to get the recognition of manufacturers. To quote from a manufacturer of shop equipment:

"It is not logical that a manufacturer should have an investment of millions of dollars in a plant equipped with the very best of labor-saving devices to produce an automobile and to have the same automobile repaired by a man with only a hammer and screwdriver to work with. This condition has been brought to the attention of the manufacturers and they know that their car owners cannot be satisfied unless there are repairshops to which they can take the machines and get efficient service."

"So the natural result is that manufacturers are requesting owners to take cars to designated service stations and are requiring their service stations to put in equipment that will enable them to give efficient service."

If every dealer analyzes his territory and studies the potential trade, it is worth his while to look seriously into the matter of labor-saving equipment. He may be short of help, he may have poor help, or he may think things are going on all right as it is, but with the ever increasing production and use of automotive vehicles it does not take a great deal of imagination to see that in the years to come repairshops and service stations are going to be called upon to do more and more work. Instead of



more shops, might we not get more out of our present shops by correct installation of equipment?

The shop that gradually is adding more and more to its equipment now will be the one sought later on. We like to go to a large hotel, not just because it is large but because it has the many little conveniences we like. Car owners are human and they seek the service station where their wants are attended to intelligently and efficiently. One contributing factor to this is good equipment in the shop.

Shop mechanics represent just so many hours of time a day and no dealer can stretch any part of this time to cover a certain amount of work. He can, however, control the work. He can get more work from his men in a given amount of time, without working them any harder.

It's just a matter of labor-saving equipment, or apparatus that conserves the energy of the men. Hard work, uncomfortable positions and poor tools make men tired, and tired men certainly cannot be expected to turn out good work.

Special equipment does not mean necessarily that the dealer must buy every so called labor-saving device on

the market. There are, of course, devices to be had that fill a universal want in every shop, large or small, but every dealer should find out the nature of the most frequent repairs and then see if there is not something he can do to lessen the time required for these repairs and make them better.

The right kind of labor-saving equipment is an investment, and an investment that pays big dividends. No repairshop, therefore, should feel that it cannot afford equipment. It is essential to good business and an investment on which money will be made.

#### SHOULD PAY FOR ITSELF IN LARGER VOLUME OF BUSINESS

The "Can I Afford It?" attitude must be changed to "I Must Afford It." The dealer who spends several hundred dollars or more on labor-saving equipment is in position to grasp all the potential repair work in his territory.

There is just this much about putting in shop equipment. If you have a shop well tooled up to handle efficiently all classes of work, you can then let your whole community know about it, and before long every piece of equipment you thought would be a liability will prove an asset. Machines are a liability when

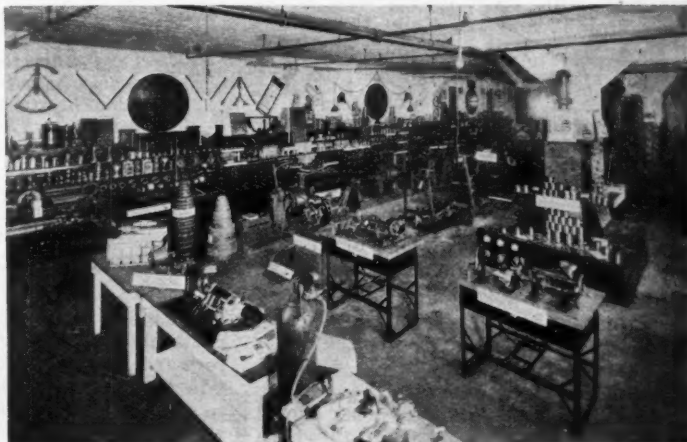
they stand idle and the problem is to make sure that they are in constant use.

Even if we grant that the small dealer needs not stock up with expensive machinery, there still remains certain other pieces of apparatus he should install in order to turn out good work with mediocre mechanics or a shortage of men. Under this class of equipment come devices like piston aligning jigs, engine stands, straightening presses, portable benches, axle stands, etc.

Why an engine stand, or an axle stand? Simply because your men cannot do efficient work when they cannot get at the parts easily or are unable to see what is going on. With an engine stand all parts are convenient to get at and the work can always be adjusted to get the best possible light. Engine stands conserve the mechanic's energy and enable him to handle the job alone at all times, because so far as getting the engine on the stand or taking it off, a chain fall does the work.

Portable benches save the mechanic's time going back and forth to the stationary bench for the vise or for other tools. While repair work on the quick service floor is not generally to be desired, there are times when this is convenient, and here again the portable bench comes handy.

### Service Equipment Now Commands Its Own Shows



Those who want to stage an equipment show might well look at the above illustrations showing the excellent manner in which the exhibits were staged at the recent show put on by the Faeth Co. of Kansas City

SOME years ago when automobile shows made their first appearance it was the usual thing to see displayed along with cars many accessories like spark plugs, lamps, tire patches and jacks. Had any manufacturer in those days thought of exhibiting a piece of machinery like a drill press, electric test bench or a blow torch he probably would have been ruled out of the show.

We have had in the last two years shows, not for the exhibition of cars or trucks, but for the equipment which either will make them better vehicles or make the job of repairing and maintaining them an easier matter. Of course, to jobbers these equipment shows mean much. While the jobber is generally pretty well acquainted with the usual lines of automobile accessories, he is not

quite so well informed, perhaps, with the vast possibilities in garage and service station machinery.

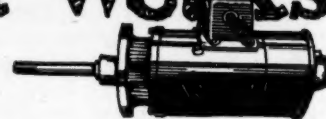
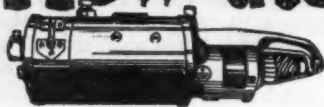
Some of the more important jobbers of the country have seen fit to put on shows of their own this year and usually these shows have been held right in their own establishments. One of the more recent shows that can be put down as one of the best along these lines was that of the Faeth Co., Kansas City, Mo. The pictures on this page tell the story and show how complete and well arranged the show was. The Faeth Co. has been located in Kansas City since 1903 and has fifty salesmen covering the south-west. The company feels that a great deal of its success in machine tool and shop equipment is due to the fact that it has treated these as separate depart-

ments and given them attention under experts in this line.

One of the points of interest about the Faeth Co.'s show was the excellent manner in which the exhibits were staged. There was ample room around the machines and equipment so that the dealers and visitors could view and inspect the exhibits comfortably. An entire floor was given up to the show. Salesmen and representatives of some of the equipment shown were on the job to give first hand information to customers. In this way the men who came to buy equipment got all the information they wanted.

So complete was the display that one could have found every conceivable article that goes to make up the tool and machinery equipment of the average service station.

# How the Electric System Works



*A Short Series of Articles Wherein Is Given the Fundamentals Underlying the Operation of the Modern Electric System as Applied to Automotive Apparatus*

By A. H. PACKER

*Instructor, American Bureau of Engineering.*

THE first time I met Bill Fixit, he was tinkering around with some new rig making a quick soldering job without any iron or anything, and between target practice at a distant cuspidor, and his interest in his job, I could hardly get a word out of him.

The next time I saw him he opened up a little, and let me get a glimpse of his ideas on things in general and on "no count mechanics" as he expressed it, in particular; and after a few more visits, he told me exactly what he thought of the other garage men in his town.

"You see," said Bill, "I figger it's about this way with them fellers that never study nothin', and yet claim they know all 'bout fixin' your car, and can doctor up your sparks and things jest right; I figger they're 'bout as reliable as a mechanic would be fixin' your engine if he didn't know why pistons had rings or why valves had springs.

"One of them birds would jess as leave use pistons without rings 'cause they go into the cylinder easier, and work up an down nice an' free, or perhaps if he was fixin' your generator, he would put in a new armature an' make you pay the bill when there was nothin' wrong but a little dirt on the old one, so I figger if a man don't know some of the reasons why, he isn't goin' to work in my shop.

"The first time I bumped into this here electrical stuff I saw it wouldn't get me anywhere to guess at it, so I started to dope it out in my own way, and if you don't mind I'll tell you the way I doped out the action of the juice, or whatever you call it.

"To begin with, the action of electricity in some ways is like drivin' a car, for spose you are goin' through sand, and the ole boiler can barely make it, an' all of a sudden, you come to a stretch of concrete, with your throttle plum wide open. You know, an' I know an' everybody knows what happens. The little ole bus jess starts to kick the road out from under an' speeds up to beat everything, and yet its the same little engine, and everthing in the car is jess the same, an' not a bit stronger than before."

This illustration that Bill gave me, was his best effort at explaining the action of a battery, when it sends current through a fine wire, or through a coarse wire, and the comparison is not

## What Do You Know About Electricity?

*NOTHING* stumps the average mechanic, and even the expert sometimes, so much as to have something go wrong with the electric system of a car, truck or tractor. You cannot see a case of electrical trouble as you can a broken axle shaft or burned-out connecting rod bearing, but it is possible to intelligently "shoot" electric trouble if you know the fundamental principles on which the systems operate.

It is the purpose of this series of articles to so acquaint the mechanic or service station operator with the whys and wherefores of the electric system that he will the better be able to render the right kind of service to his customers. There is nothing like knowing how, and how to "shoot" some of the more common forms of electrical troubles will constitute a large part of this series.

so bad either, for the sand road, certainly acts as a resistance to the forward motion of the car, just as the fine wire, makes it hard for the current to get through. The action of the car when it strikes the concrete also illustrates the action of a battery connected to a heavy cable as in a starter circuit. Here with little opposition, the flow of current is greater than in the fine wire, just as the car with little to resist its motion, began to increase in speed.

This natural action, as applied to electrical circuits, is known as Ohm's law, but we do not have to be afraid of it for that reason, and as this law is the basis of the flow of water, this return is illustrate its action and application, by means of the circuits illustrated in Fig. 1 and Fig. 2 which show similar conditions in the action of water and electricity.

In these two figures we have the battery compared to the tank full of water, for the tank is ready to allow water to flow whenever the valve in the pipe line is opened, and the battery is ready to allow an electrical current to flow whenever the switch closes to complete the electrical circuit.

The pipe from the bottom of the tank to the flow meter corresponds to the wire from the battery to ammeter. The flow meter measures the rate at which water is being used, and the ammeter measures the rate at which electrical current is being used.

The water motor is driven by both the amount and pressure of the water striking its blades, and the electric motor is driven by both the amount (amperes) and the pressure (volts) of the electrical current that flows through it.

In all electrical circuits, a wire returning to the battery is as necessary as a wire from the battery, and in the case of the flow of water, this return is equally necessary.

This return pipe carrying air back to the tank, is of course not absolutely necessary, but is shown to complete our illustration, for while the pipe might be omitted, the entrance of the air to the top of the tank can not be omitted, for we all know that if the top of the tank were sealed, a vacuum would form in the top of the tank and the water would stop flowing from the bottom. Thus we see that even in the flow of water a return circuit of some kind is needed.

In the hydraulic illustration, a pressure gage indicates the head of water, acting to force a current to flow, while the voltmeter in similar manner records the electrical pressure of the battery. In either case, the greater the pressure, the faster the current will flow.

When water begins to flow from the tank to the water motor, it encounters some frictional resistance in the roughness of the sides of the pipe, and even if the pipe is very smooth there is considerable retarding action which cuts down the flow of water available at the motor. This friction or resistance to the current is found to be greater with a small pipe than with a large one, and, of course, increases with the length, as well as being affected by the nature of the surface of the pipe.

In similar manner when the electrical current starts to flow through the wire, it encounters some resistance or opposition which we can liken to the resistance of the sides of the pipe. We also find that the smaller the wire, the greater this resistance becomes, and with increase in length, the resistance is likewise increased. The nature of the



material, too, has an effect on the opposition to current flow, just as the roughness of the pipe affected the water.

Let us now tabulate a few quantities which will give us some familiarity with the electrical terms, so often confused by the average person.

Pressure—Hydraulic, Lbs. per Sq. In.; electrical, volts.

Flow—Hydraulic, gallons per Sec.; electrical, amperes.

Pressure Meter—Pressure gage; electrical, voltmeter.

Flow Meter—Flow indicator; electrical, ammeter.

Controls Flow—Hydraulic, valve; electrical, switch.

Mechanic Action—Hydraulic, from water motor; electrical, electric motor.

Resistance—Hydraulic, of pipe; electrical, of wire.

So many mistakes are made in the use of the words Amperes and Volts, that we wish to illustrate a few of these errors. Here is a common statement: "I had 6 Volts flowing in that circuit." This is just as wrong as to say that 60 Lbs. per sq. in. is flowing through a pipe.

Now we know that 60 lbs. pressure would cause water or steam to flow, but it does not flow. In a similar way the voltage causes current to flow, but the voltage does not flow.

Another mis-application of the terms is this: "How many amperes are there in that battery?" Now amperes express the rate at which current flows, and with no wires on the battery, there is obviously no flow, hence no answer to the question.

Let us now consider the exact statement of Ohm's law, the common sense operation of which we have just been considering.

Assume that a battery has a pressure of 1 Volt, and that it is connected up to such a circuit, that the resistance

of the wire holds the current to 1 ampere. We then say that that wire has a resistance of 1 Ohm.

To express the same thing mathematically, we have three equations, as follows:

$$(1) \text{ Volts} = \text{Amperes} \times \text{Ohms or } E = I \times R$$

$$(2) \text{ Amperes} = \text{Volts} \div \text{Ohms or } I = E \div R$$

$$(3) \text{ Ohms} = \text{Volts} \div \text{Amperes or } R = E \div I$$

The equations at the left are in terms that we have just explained, while those at the right express the same thing in algebraic form. In these "E" stands for Electro Motive Force, which is just another name for voltage or electrical pressure.

"I" stands for current which may seem a strange letter to use but the letter "C" has to be saved for another electrical term that we get to in our ignition work, while "R" rather obviously stands for resistance.

It is the intention of these articles to help the practical man become more practical, not by feeding him with theory that he cannot use, but with workable mental tools that he can use in his every-day practice. We shall therefore consider a few practical cases that come up in the electrical shop.

#### Problem (1)

A Ward Leonard rheostat has been purchased by a battery shop for use in regulating the current when charging batteries. On the name plate it is marked 10 ohms, and before connecting it in we wish to figure whether it is safe to use without a large number of batteries on the line to cut down the current.

Assuming that the line voltage is 110 and that we only have 1 six volt battery on charge, we will have the difference, or 104 volts to be taken care of by the

rheostat, and therefore have the following data:

E equals 104 Volts

R equals 10 Ohms

Question: What is "I"? Using the No. 2 equation we find that the current, "I" equals 104 divided by 10 or 10.4 amperes, so we know before throwing the switch, just what is going to happen, BEFORE IT HAPPENS, which is much more satisfactory than looking at a burnt up piece of apparatus, AFTER IT HAPPENS.

In the above case, if the line had been fused with 10 ampere fuses we would know that they should be replaced with 15 ampere size, as the others would probably blow very quickly.

#### Problem (2)

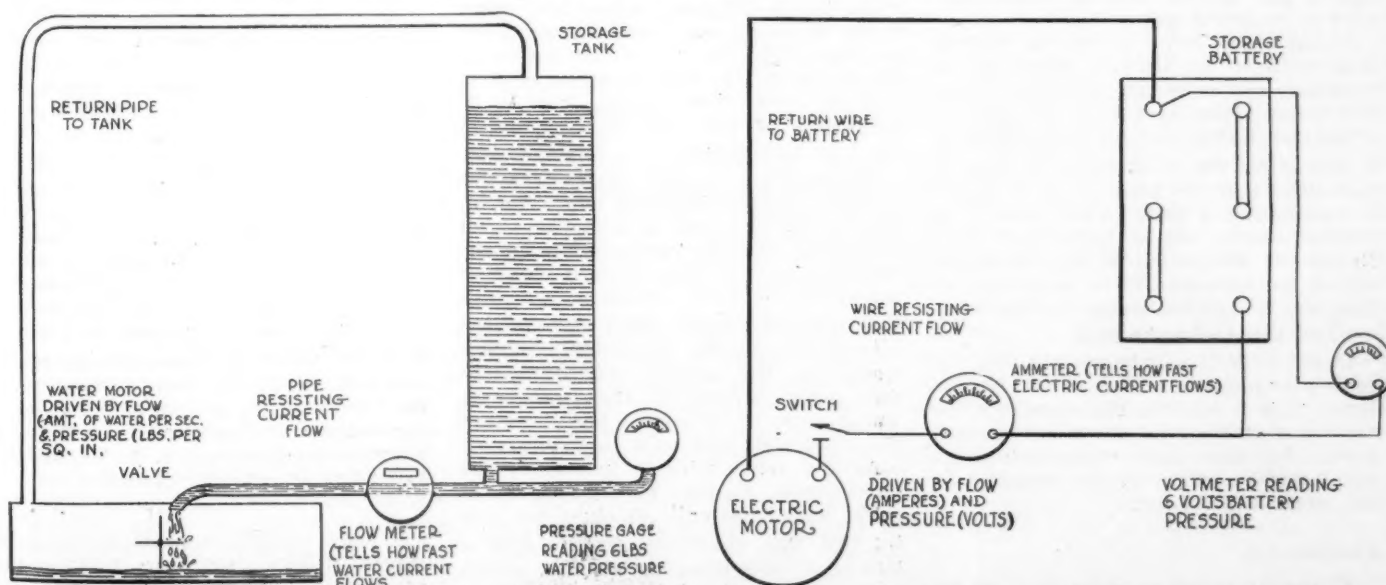
The field coils of a generator have 4 Ohms resistance, and they are supposed to carry 1.5 amperes under normal operation. The question naturally arises, as to the voltage required to send this current through the coils. We now use equation (1) and find the voltage by multiplying the amperes and ohms together, and as 4 times 1.5 equals 6, we know that a six volt battery will send the proper current.

#### Problem (3)

A 21 candle power lamp for use in a head lamp, is tested, by using a 6 volt battery and an ammeter, and it is found that the battery sends 2.4 amperes through the filament. A voltmeter is, of course, used connected to the battery terminals as in Fig. 2 to see that the battery voltage is exactly 6. To find the resistance of the lamp in ohms, we now use equation (3) which tells us to divide the volts by the amperes. We accordingly divide 6 by 2.4 and find that 2.5 is the resistance of this lamp in ohms.

The repairman may feel that a study of these problems will not help him and is rather impractical, but let us consider

## A Simple Example of How Electric Current Is Measured



The diagram to the left shows by a simple water analogy the functioning of the electric wiring diagram to the right. It will be noted that the voltmeter registers pressure and is connected directly across the line while the ammeter registers the amount or rate of flow and is therefore in series with the line. It will be appreciated from this that the resistance of a voltmeter will necessarily be large compared to an ammeter.

a few cases where an understanding of Ohm's law helps out.

- (1) To figure the reason that when two lamps are wired in series, one may be brighter than the other.
- (2) To figure why it is that when head lamps are turned on in the dim position (a dimming resistance being used), if one lamp is removed from its socket, the other gets brighter.
- (3) To figure why a copper wire the size of the lead in a pencil is big enough for ignition circuits, while the starter cables have to be the size of your finger.
- (4) To be able to use a voltmeter, and tell in a few minutes exactly which of four terminals is making poor electrical contact, when they all seem to be tight and O.K.
- (5) In a set of Ford magneto coils, to tell by testing exactly which coil is grounded, instead of having to disconnect them all and test separately.

Thus the illustrations could be continued indefinitely, but it will appear that a mental tool of this kind is worth any amount of effort spent in obtaining it, and in the following articles practical trouble shooting cases as above illustrated will be worked out in detail.

#### BROWN & SHARPE TABLE UNIVERSALLY USED

In a previous part of this article we took up the conditions that affected the resistance of a wire, and found they were length, size and material, the resistance being greater in a long wire than in a short wire, and greater in a fine wire than in a large wire. There is no definite way of figuring the effect of material, but by experiment, it has been determined that copper is the best commercial material available as it has the lowest resistance. The characteristics of copper wire are shown in the Brown and Sharpe table given below, as the Brown and Sharpe gage is universally used in electrical work.

In the above table it will be noticed that Number 10 wire is 1/10 in. in diameter, approximately, and that it has just about 1 ohm resistance per 1000 ft. If we then notice that for an increase of 3 sizes, from ten to thirteen the area is just about half, we have a way of quickly calculating a table of our own, if a regular one is not at hand, and since Number 13 wire is half as big, we would expect its resistance to be twice that of Number 10 and referring to the table we find this to be the case.

In the table it will be noticed that the resistance is given at a certain temperature. This is because the resistance increases somewhat as the wire becomes hotter, but for slight changes in temperature, the extent of the variation is not worth considering.

#### Problem (4)

A starting motor is to be wired up on a car, and we wish to see what would happen, if we tried to use 10 ft. of Number 10 wire for the job. From the tables we find the resistance of this wire to

### Weights, Lengths and Resistances of Copper Wires.

Gauge A. W. G. B. & S.	Diameter, inches	Area, circu- lar mils	Weight		Length		Resistance in international ohms		Gauge A. W. G. B. & S.
			Lbs. per foot	Lbs. per ohm, at 20° C., 68° F.	Feet per lb.	Ft. per ohm, at 20° C., 68° F.	Ohms per lb., at 20° C., 68° F.	Ohms per ft., at 20° C., 68° F.	
0000	.460	211,600	.6405	13,090	1.561	20,440	.00007639	.00004893	0000
000	.4096	167,800	.5080	8,232	1.960	16,210	.0001215	.00006170	000
00	.3648	133,100	.4028	5,177	2.482	12,850	.0001931	.00007780	00
0	.3249	105,500	.3195	3,256	3.130	10,190	.0003071	.00009811	0
1	.2893	83,690	.2533	2,048	3.947	8,083	.0004883	.0001237	1
2	.2576	66,370	.2009	1,288	4.977	6,410	.0007765	.0001560	2
3	.2294	52,630	.1593	810.0	6.276	5,084	.001235	.0001967	3
4	.2043	41,740	.1264	509.4	7.914	4,031	.001963	.0002480	4
5	.1819	33,100	.1002	320.4	9.980	3,197	.003122	.0003128	5
6	.1620	26,250	.07946	201.5	12.58	2,535	.004903	.0003944	6
7	.1443	20,820	.06302	126.7	15.87	2,011	.007892	.0004973	7
8	.1285	16,510	.04998	79.69	20.01	1,595	.01255	.0006271	8
9	.1144	13,090	.03963	50.12	25.23	1,265	.01995	.0007908	9
10	.1019	10,380	.03143	31.52	31.82	1,003	.03173	.0009972	10
11	.09074	8,234	.02493	19.82	40.12	795.3	.05045	.001257	11
12	.08081	6,530	.01977	12.47	50.59	630.7	.08022	.001586	12
13	.07196	5,178	.01568	7.840	63.79	500.1	.1276	.001999	13
14	.06408	4,107	.01243	4.931	80.44	396.6	.2028	.002521	14
15	.05707	3,257	.009858	3.101	101.4	314.5	.3225	.003179	15

Gauge A. W. G. B. & S.	Diameter, inches	Area, circu- lar mils	Weight		Length		Resistance in international ohms		Gauge A. W. G. B. & S.
			Lbs. per foot	Lbs. per ohm, at 20° C., 68° F.	Feet per lb.	Ft. per ohm, at 20° C., 68° F.	Ohms per lb., at 20° C., 68° F.	Ohms per ft., at 20° C., 68° F.	
16	.05082	2,583	.007818	1.950	127.9	249.4	.5128	.004009	16
17	.04526	2,048	.006200	1.226	161.3	197.8	.8153	.005055	17
18	.04030	1,624	.004917	.7713	203.4	156.9	1.296	.006374	18
19	.03589	1,288	.003899	.4851	256.5	124.4	2.061	.008038	19
20	.03196	1,022	.003092	.3051	323.4	98.66	3.278	.01014	20
21	.02846	810.1	.002452	.1919	407.8	78.24	5.212	.01278	21
22	.02535	642.4	.001945	.1207	514.2	62.05	8.287	.01612	22
23	.02257	509.5	.001542	.07589	648.4	49.21	13.18	.02032	23
24	.02010	404.0	.001223	.04773	817.6	39.02	20.95	.02563	24
25	.01790	320.4	.0009699	.03002	1,031	30.95	33.32	.03231	25
26	.01594	254.1	.0007692	.01888	1,300	24.54	52.97	.04075	26
27	.0142	201.5	.0006100	.01187	1,639	19.46	84.23	.05138	27
28	.01264	159.8	.0004837	.007466	2,067	15.43	133.9	.06479	28
29	.01126	126.7	.0003836	.004696	2,607	12.24	213.0	.08170	29
30	.01003	100.5	.0003042	.002953	3,287	9.707	338.6	.1030	30
31	.008928	79.70	.0002413	.001857	4,145	7.698	538.4	.1299	31
32	.007950	63.21	.0001913	.001168	5,227	6.105	856.2	.1638	32
33	.007080	50.13	.0001517	.0007346	6,591	4.841	1,361	.2066	33
34	.006305	39.75	.0001203	.0004620	8,311	3.839	2,165	.2605	34
35	.005615	31.52	.00009543	.0002905	10,480	3.045	3,441	.3284	35
36	.0050	25.00	.00007568	.0001827	13,210	2.414	5,473	.4142	36
37	.004453	19.83	.00006001	.0001149	16,660	1.915	8,702	.5222	37
38	.003965	15.72	.00004759	.00007210	21,010	1.519	13,870	.6585	38
39	.003531	12.47	.00003774	.00004545	26,500	1.204	22,000	.8304	39
40	.003145	9.888	.00002993	.00002858	33,410	.9550	34,980	1.047	40

be 1 ohm per 1000 ft. so that 10 ft. would have a resistance of .01 ohms.

To operate a starting motor requires a very heavy current, which may run up to 400 or 500 amp., before the engine starts to turn, and which drops down to about 125 amp. while the engine is turning over. We will therefore, assume that 400 amp. flows through our 10 ft. of Number 10 wire, and we wish to find the loss of voltage.

Our equation for this requires that we multiply amperes by ohms and when we do this we find that 4 volts have been lost in forcing the current through the wire, and as the battery when cranking the engine is down to about 5½ volts, it is easy to see that there remains but 1½ volts to operate the motor. Another trouble in this problem would be that this much current in the small wire would make it get very hot, burn off the insulation, and melt in two.

As the small wire is inadequate for our purpose, suppose we try Number 10 cable, which has only .01 ohms per 1000 ft., and will, therefore, require only a loss of .4 volts when the starting switch is first operated. Subtracting this loss from the battery voltage, now gives 5.1 volts available at the motor, so that we now have a practical working condition.

(Article II Next Week.)

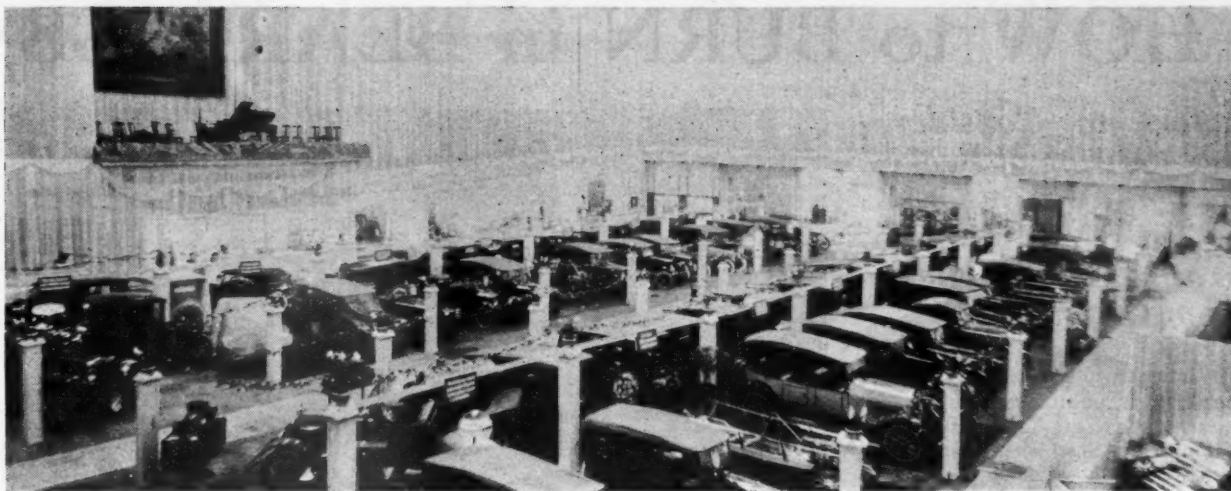
### Optimism Pervades Meeting of Equipment Association

Chicago, April 8—A general feeling of optimism in conditions was expressed by manufacturers and jobbers from various sections of the country at the mid convention of the Automotive Equipment Association held here. One jobber stated that his business thus far this year was better than that of a year ago and that while there was a slight falling off in March, the net profits so far this year were about two per cent greater than for the same period a year ago. A manufacturer also reported that his business was 18 per cent better than last year.

A committee was named with President Stranahan as chairman to review business conditions and devolve plans for stimulating and promoting more harmonious business relations between manufacturer, jobber and dealer, and the expanding of trade in general.

A show committee consisting of N. H. Oliver, Illinois, chairman; William Von Elm, New York, vice-chairman; Charles C. Gates, Colorado; W. E. Wissler, Iowa, and W. H. Parkin, Michigan, was appointed to arrange the annual show to be held in November.





A view of the Denver show with the cars set off in pleasing contrast against the snow white back ground

## Couldn't Hold Show? Denver Does

Dealers in "Out Where the West Begins" Combat Talk Current Three Months Ago and Stage Event Where Buying Interest Manifests Itself in Higher Degree Than Ever Before

**D**ENVER April 7—Huge clouds of gloom have rolled away, and the snow-capped peaks of the mighty Rockies are glistening with an added brightness brought to this region by the sunshine of Denver's automotive "selling" show, now holding forth the Municipal Auditorium.

Anyhow, this is the way the show is appreciated by the Denver Auto Trades Association, which is staging the event and by motor car and accessory dealers and service men throughout Colorado, Wyoming, New Mexico and the parts of Nebraska and Kansas included

in the average distributing territory reached from Denver. This doesn't mean that everything is perfectly lovely and ideal with the motor car business "out where the west begins," but it does mean that the courage of the few who baffled black forebodings and converted prophets of disaster into exhibitors of their best goods and their most radiant smiles—that this courage is bearing fruit in genuine sales when badly needed in new life injected into "prospect" lists and in a far more cheerful outlook than the Rocky Mountain territory's main "Automotive Row" has possessed in many months.

**T**HREE months ago, there was a lot of talk that Denver couldn't have a show this year. But the idea that Denver simply couldn't afford to miss having a show this year was sold by a few in whose hearts burned the sort of dauntless faith that the Bible tells us is powerful enough to remove mountains. And now the show itself is being sold to the public to the tune of about 5,000 daily attendance, with plenty of the visitors in a buying mood.

There was a snowstorm Tuesday evening and another Wednesday afternoon and evening, with the temperature taking on a sharp chill. But it takes more than a moderately unfavorable turn in weather conditions to give a serious setback to a really good motor show in this part of the country where a leading evidence of the spirit of sturdiness is a highly developed matter-of-course enjoyment of year-round motoring.

Prosperity Day, Club Day, Intermountain Day, Appreciation Day and Boosters' Day were established in the program to win special attention from different groups of those admiring things automotive, and this plan is proving to be

a worth-while feature. Excellent concerts are provided, in which the city's nationally famed \$85,000 organ has a prominent part. The decorations are simple, but of a nature to set off the exhibits tastily.

Thirty-two passenger car dealers are showing two models each, and there are forty-five accessory booths. There is approximately 25,000 square feet of floor space, about evenly divided between the car and accessory sections of the show.

Although only eleven actual sales of cars have been reported thus far, the dealers regard this as a favorable record. They also expect a substantial enlivening of sales during the remaining two days of the show, along with a big increase in attendance.

Any attendance comparison between the shows of this year and last would be impractical, the show committee points out, for three reasons: Last year's show, held in the Stockyards Stadium, had an enormous amount of floor space, which accommodated not only a larger crowd at any one time but also gave dealers far more exhibit room.

In addition to passenger cars and accessories, trucks and tractors were also given an exhibition section last year. And passes were given out in vast numbers a year ago, as against a carefully restricted issue of passes this year.

But the big thing the dealers are looking for is buying interest, and this they are getting in far higher degree than ever before, they say. Some of them are putting extra salesmen on the show floor to take care of inquiries that mean business rather than curiosity. One reason for this, they believe, is the fact that the average person that pays for his admission to an automobile show has a more definite reason for going than the fellow that has been given a free ticket. And the proportion of paid admissions is exceptionally high this year.

Besides regular stock models, there are a good number of show-built specials from factories going in extra strongly for 1921 shows. Two miniature models are drawing a great deal of attention to the Marmon exhibit, for example, while a Gardner with a plate-glass hood and illuminated motor is win-

*Concluded on page 37*

# HOW to BURN in BEARINGS

*Factors to Consider Are: Setting of Bearing Caps, Temperature of Caps While Burning in and Condition of Crankshaft*

THE burning-in process of fitting bearings is one of the fastest and most efficient methods. It is relatively simple but best results can only be obtained through experience. At factories where time is always an important factor, the bearings are burned in at high speed for about one and one-half minutes. With a Ford block, about 50 hp. is required to break the bearings and burn them in. The machine which is generally used for service station work is usually driven by a 15 hp. motor through a train of gears with a ratio of about three to one and it requires about five minutes to burn the bearings in. In all cases the bearings are burned in dry but oil is sometimes poured over the cap after two or three minutes of operation.

The machine shown in Fig. 1 is a typical type of a combination burning-in and running-in stand. The design is such that the bearings are exposed to the view of the operator while being burned in. The base is provided with openings large enough so that the pistons and connecting rods can be installed or fitted without removing the block from the machine. A quick adjusting alignment device is provided on the right hand engine support for aligning the Universal joint

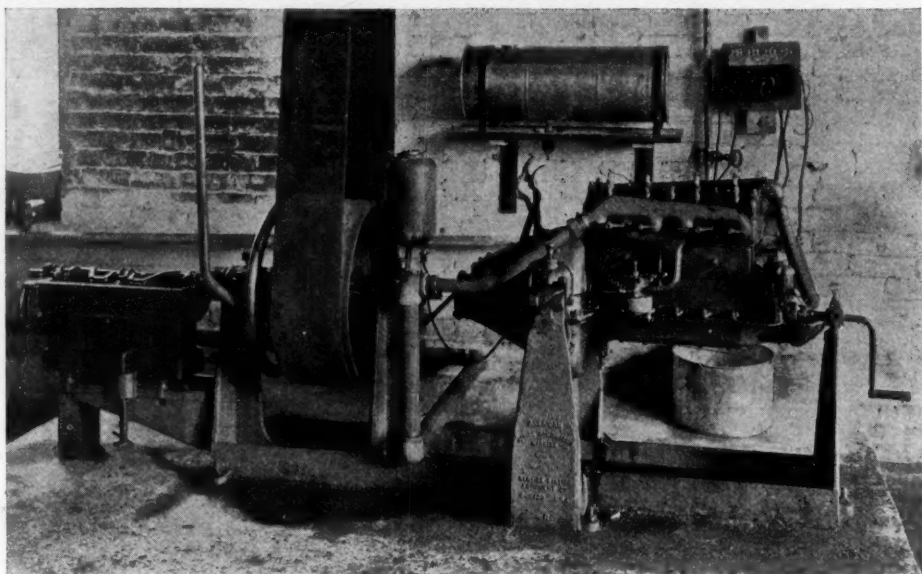


Fig. 1—A view of the American Junior Universal burning-in and running-in machine with a Ford block on the burning-in side and an assembled Ford engine on the running-in side. This particular machine is manufactured by the Fairbanks Co. of New York

quickly and accurately. The clutch is equipped with a tryout wheel so the stiffness of the engine bearings can be determined without removing the unit from the machine.

Burning-in machines can be purchased at a very reasonable cost and can be put to other uses such as driving rear axle assemblies.

## EXPERIENCE NEEDED FOR CERTAIN IMPORTANT FACTORS

Burning-in a set of bearings is really an art and without any experience, it is an easy matter to lose a good many jobs. The important factors to consider are the setting of the bearing caps, the temperature of the caps while burning-in, and the condition of the crankshaft. With a standard size shaft and standard bearing it is possible to get at least a 90 per cent bearing surface of the metal, if the job is properly done. If the shaft has been reground and is undersize it will require a great deal of care to obtain a good fit. To illustrate the process, take a Fordson tractor engine with a reground crankshaft, about .015 in. undersize, and burn in a set of standard bearings.

The first step is to entirely disassemble the engine, removing the cylinder head, valve, pistons, connecting rods, camshaft, flywheel and lower half of the crankcase. Remove the bearing caps and crankshaft. The babbitt is melted out and the bearings rebabbitted. A bearing boring machine such as shown in Fig. 2 is usually used to cut out the babbitt to the approximate size, after which it is necessary to scrape the bearing a little. The block is then turned upside down and clamped into the machine as shown in Fig. 3. The bearing caps are placed over the shaft and when the caps are

rocked there should be about 1/64th in. gap. The caps are bolted down tight, without shims, and the machine started up. The bearings are usually run dry about two or three minutes and then .001 in. shims inserted.

A good grade of heavy cylinder oil is poured on the bearings and the process continued for about five minutes. The caps are removed and an examination made to determine what kind of a bearing surface has been obtained. If not satisfactory, adjustments will have to be made such as cutting out more babbitt or filing down the bearing caps, as the case may require. The process is then repeated until a good fit is obtained. The running-in temperature is just below the melting point of the babbitt. An experienced man can tell the approximate temperature by dropping on a little water but the average man would not be able to do this. Some of the machines are provided with a thermometer which gives the temperature of the bearing caps at all times. After a proper fit has been obtained the engine is completely assembled and run in for about two hours with oil. At the end of this time it ought to be an easy matter to crank the engine and allow it to run under its own power.

## ANOTHER CHICAGO SHOW

Chicago, April 9—Following upon the success of the Westside Automobile Dealers' Association show which resulted in the actual sale of 120 cars, the North Shore Automobile Dealers' Association has decided to hold a show in the Fourth Regiment Armory beginning April 19. George Marquette of the Marquette Motor Sales Co. is president of the dealers' association.

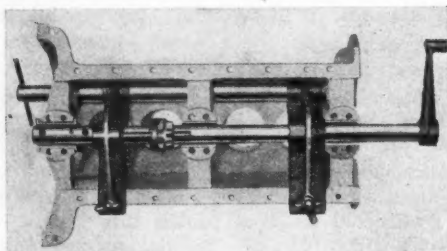


Fig. 2—A bearing reboring tool manufactured by the Detroit Garage Equipment Co.

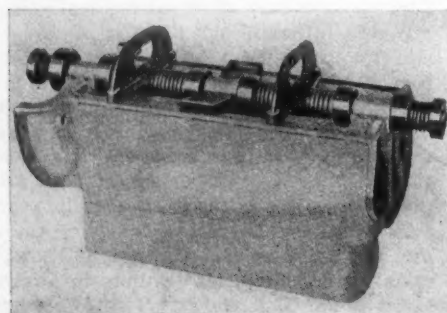


Fig. 3—A rebabbiting outfit manufactured by the Detroit Garage Equipment Co.



# Shortage of Fuel and Lower Gravity Will Dictate Future Changes in Engine Design

*Three or Four Years' Time Will See Many Changes Made in Engine Construction Caused by Menace of Crankcase Dilution and Lowering Gravity of Fuel*

By Roy E. Berg

CERTAIN things are going to be changed in regard to the construction of engines, manifolds, carbureters and the parts related to fuel combustion, within the next three or four years. Conditions in the fuel market are becoming more nearly impossible as days go on. Demand is growing, and quantity to supply the demand is becoming more and more limited. As the quantity diminishes, the refineries reach deeper and deeper into the high end point fuels, and so the fuel becomes heavier, with the result that starting becomes more difficult and worse than all, crankcase dilution increases. It was only within recent months that another boost was given the end point of fuel and as a result its gravity descended still lower.

There is one thing that we are all familiar with in burning heavy gasoline and that is the fuel knock. To overcome the fuel knock engineers have devised means of injecting iodine and aniline into the fuel mixture which eliminates the knock. Before the discovery of "doped" fuels it was customary to reduce or eliminate the knock by lowering the compression of the engine. This, however, is but a very poor means to employ for with it is experienced such a tremendous loss in power. The efforts of engineers are always being directed to produce more from the same material, or, in other words, to increase efficiency. Therefore, it is a poor expedient to reduce compression pressures in order to eliminate fuel knocks. The thing to do is to increase the compression and still eliminate the fuel knock.

## The Theory of Turbulence

On the average the compression pressures of engines run in the neighborhood of 65 to 70 lb. per sq. in. There are some that run higher than the figures given. If we raise the compression pressure of an engine from 65 lb. to 85 lb. the horsepower is increased quite materially and this means more power from the same weight of engine.

One authority on fuel combustion is working on the principle of turbulence, as a means to overcome the effects of the fuel knock and at the same time increasing the compression pressures. The effect of turbulence within the cylinder of the engine is limited in its extent of application to cylinders of moderately high compression. Just how far this theory will aid the situation is not known, but very effective results

have been and are being obtained in commercial work with compression pressures up to 85 lb. Turbulence is as its name implies the surging or volcanic effect of the gases. The higher the degree of turbulence within the cylinder the higher the compression can be made. The subject of turbulence promises the most immediate relief from the troubles of the fuel situation, but if the end point of the fuel goes to much higher altitudes, then more effective relief is going to be obtained from doped fuels.

Just how soon the public may reap the rewards of these expensive experiments is rather difficult to say. The engines that are designed for greater turbulence within the combustion chamber are being given to the engine buying public now. When the question of doped fuel is considered though, it is a question of time and creating and public approval before the devices may be universally accepted. The dealers of this country can do a great deal of good for the industry, if when improvements of this kind are announced, they will study the solutions that the engineers are offering. The public must have some source for its information and these sources might just as well be the service stations where the motor car experts are.

Four and five years ago such a thing as crankcase dilution was rarely heard of. It was not uncommon to run with the same oil in the crankcase during the whole year, replacing only that amount that was burnt away. The oil never became so thin that its lubricating value was lost. Today the situation is reversed. Oil does not need to be replaced because it burns away, although there is much of it that does disappear this way. The main reason for replacing the oil these days is to keep the viscosity of the oil up, or in other words, to retain its relative degree of consistency. The first thing that happens to a fresh batch of lubricating oil in the crankcase of an engine these days is that its gravity, flash point and viscosity are lowered from the very first time that the engine is started.

The problem of keeping the oil thick and thus retain its lubricating properties is going to be largely solved by the methods used to insure complete combustion of the fuel. If differently constructed pistons are used which com-

pletely separate the combustion chamber from the lubricating chamber then the trouble can be overcome mechanically. This type of construction was employed during the world war in the Ricardo engine and gave very good results.

There are many and various estimates as to the amount of machinery that is being worn out annually because of the crankcase dilution menace. Higher compressions are going to give higher engine heat and, therefore, more complete combustion. Consequently less fuel will be left in the combustion chamber to drain to the oil chamber below.

Regardless, though, of how high the compression is there will always be the initial start to consider and this is the period of the operation that does the most damage. While the engine is being warmed up, there must necessarily be some temperatures below the fullest efficiency point and during these moments there is going to be some crankcase dilution.

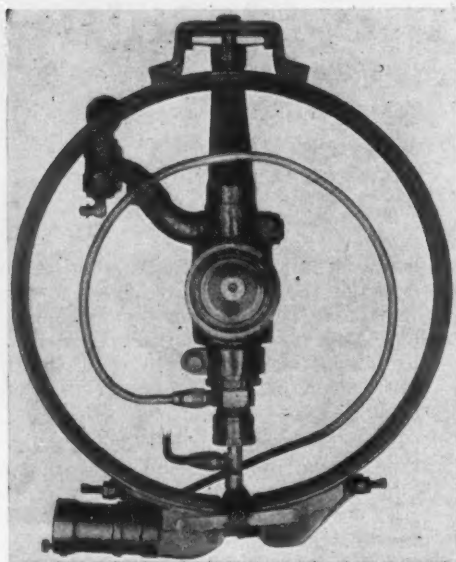
## A Device to Purify Oil

This is why intensive development work is being done on appliances to be used for determining the dilution point where the oil is no longer a good lubricant. We may expect to see before long such devices on our cars, but as yet their exact nature of construction can not be disclosed. The seriousness of the lubrication problems are demanding that some imperative steps be taken to help the situation. One other device that is going to do a great deal to help the situation is one that will constantly purify the oil, while the car is running. The operation of the device is just like that of an oil refiner, with which heat is used to distill the volatile particles that have diluted the lubricant. After being refined by the heating process, the oil is caused to pass through a very fine screen which removes all foreign material.

Still other things are being experimented with in the line of improvements for the oiling system. It is the plan or at least the idea of some engineers that the lubricating oil may be treated with some material that will retain the viscosity of the oil regardless of how much dilution occurs. Viscosity is after all the whole problem of the lubricating question and if this is retained fairly constant regardless of dilution then the question is answered.

# Four-Wheel Brake Ready for All Cars

## Hydraulic Braking System Can Be Installed by Dealers on Cars Now in Use



Assembled view of the four-wheel hydraulic brake, which is made for all cars

A FOUR-WHEEL hydraulic braking system is announced by the Four Wheel Hydraulic Brake Corp., Detroit. The company is selling license rights for the use of this system to manufacturers and is appointing dealers to sell it to the owners of cars now in use. The Dusenber Motors Co. is the first manufacturer to acquire a license and it was this system which was seen on the straight-eight which was exhibited at the New York Automobile Salon in November.

As to cars already in use, the company is ready at the present moment to supply it for Pierce-Arrows but the system will be available for other popular makes in a short time. The price of the system installed on the Pierce is \$250. The work of installation is not difficult and no special tools are required.

The system as applied to the Pierce may be considered as standard as it will only be modified in minor details being adapted to other makes.

Brake bands of the usual type are employed but they are actuated hydraulically instead of mechanically. The old brake pedal is removed and in its place is put a pedal pad which is attached to a plunger. When the pedal is depressed it moves the piston in the master cylinder and the pressure generated therein forces oil through pipes to individual cylinders on each brake. As soon as the foot is removed from the pedal the brake bands are moved away from the drums by a spring in each brake cylinder. Heavy gage copper tubing is used between master cylinder and individual brake cylinders, the connection between frame and axle being by means of a special combination swivel and slip joint which has been so carefully worked out that it does not leak.

The master cylinder is always filled with oil inasmuch as it is connected to a

small reserve tank with two automatic valves between, so that, if for any reason some oil is lost, it is automatically made up by flow from the reserve past the two check valves to the master cylinder.

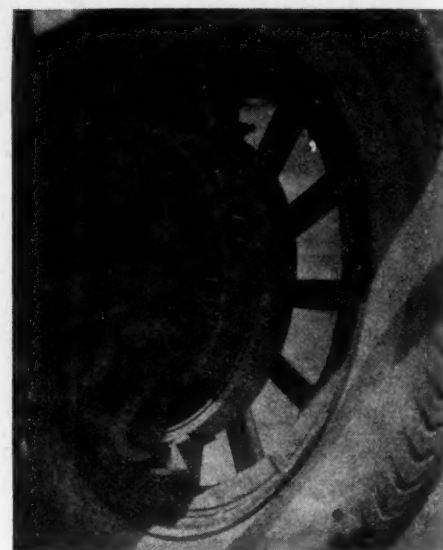
The advantages of the hydraulic system are greater simplicity, perfect equalization of all four brakes, less friction and therefore less effort to apply them. One reason why four wheel brakes have not been generally adopted has been the difficulty of connecting the mechanism up with the front wheels, but this difficulty is easily overcome with the hydraulic system. Oil flows from the master cylinder through small pipes along the frame member to the swivel joint which is placed near the rear end of the front spring. From thence a pipe leads to the brake. The cylinder which operates the band is placed at the top and the band itself is anchored at the bottom by a fitting which sticks out from the underside of the axle. The oil pipe enters a fitting above the king pin, the oil passing through a swivel joint and then out through a C shaped pipe which runs to the brake cylinder. This pipe, because of the swivel joint is free to swing with the wheel. No adjustment is required.

The rear drums are not disturbed. The contracting mechanism is simply removed and the new mechanism put in its place. The expanding emergency brake system is not touched.

The big advantage of the four-wheel braking system is the unusual stopping ability which it affords, and this is a matter of especial importance when the question of reducing automobile accidents is considered. Performance figures are given below:

Speed	Stopping Dist. Ordinary Brakes	Stopping Dist. Four Wheel Hydraulic Brakes
		Brakes
10	9.6	4
15	20.8	9
20	37.0	16
25	58.0	23
30	83.0	36
35	113	49
40	148	64
45	187	81
50	231	100
55	280	121
60	333	144

It is difficult to realize the import of these figures without riding in the car. Stopping from 10 miles per hour in 4 ft. means that if the brakes are applied when the radiator is abreast of the mark, the car will be halted by the time the windshield is over the mark. Stopping from a speed of 60 miles per hour in 144 ft. is an extremely quick stop when



Four-wheel hydraulic brake installed on front wheels of Pierce Arrow. This installation was made by the Courtesy Service & Sales Co., Chicago

traveling at that speed. When driving at this speed the eye unconsciously looks 400 to 500 ft. ahead. Just 144 ft. away seems to be just beyond the radiator cap and it really is a very short distance. A machine with this equipment decelerates so readily that if an extremely quick stop is made the passengers will slide out of their seats unless they are slightly braced for it. The pedal has an easy action and a very slight pressure will hold the car, and at the same time it is possible to lock all four wheels. With all four wheels locked the car will not skid on wet or icy pavements.

The hydraulic system was originated several years ago as a means of controlling tractors used in logging work. In California in certain lumber regions it was the custom to haul the lumber down the mountains with truck and trailer equipment. Inasmuch as only the rear wheels of the truck had braking equipment it frequently happened that the trailers would overrun the truck on a steep grade and that a serious accident would occur. Finally it became next to impossible to obtain drivers. It was to meet this need that the hydraulic system was developed. Since then it has been applied to many passenger cars and has been used on some racing cars so that the system cannot be considered new or untried.

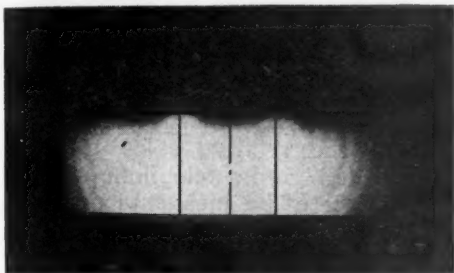
### PILOT, 80 PER CENT CAPACITY

Richmond, Ind., April 8—Plants of the Pilot Motor Car Co. and the Geo. W. Davis Carriage Co. are operating on about 80 per cent capacity, according to information from both factories. The Davis company expects to have full capacity operations underway soon to accommodate a good increase in business recorded in the last ten days.



# Non-Glare Lights Standard on Ford

Will Also Be Sold by  
Ford Dealers for  
Installation on Cars  
Now in Use for About



Both headlamps properly aligned and focused

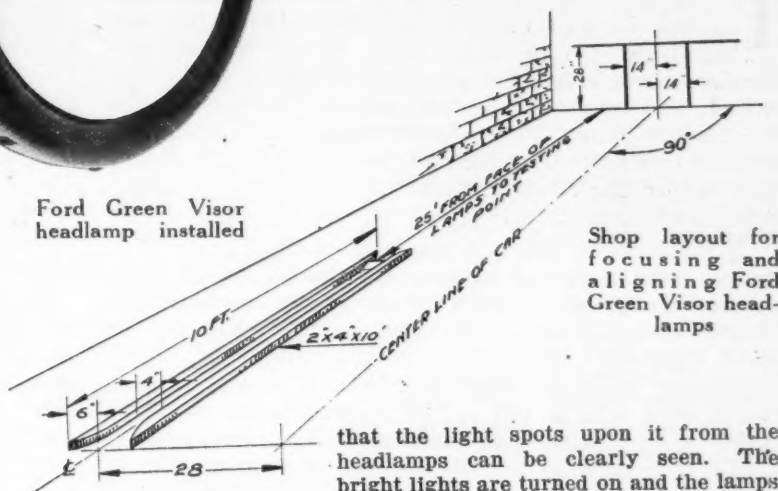
FORD cars are now coming through regularly equipped with non-glaring headlights known as the Ford Green Visor headlamps. Installation of these headlamps started during the month of March, and now all cars coming through are regularly equipped with the new visor device. In addition to the cars now being manufactured at the plant, the Ford company will place on sale immediately replacement lenses for the cars already on the market. The lenses will be sold by Ford dealers at a very low price, probably not more than \$1.00 per pair, although the exact amount has not as yet been set.

The new headlamp has been tested and approved in the states of Connecticut, New York, Pennsylvania, Maryland, Wisconsin, District of Columbia and in the city of Detroit. Tests are at present being made in California, which will probably give approval since the regulations are identical with those of the state of Connecticut.

Tests have been made on this lamp at the electrical testing laboratories, New York City, and show a candlepower obtained at various points on a screen 100 ft. ahead of the car to correspond with the laws required by the states of Connecticut, New York, Pennsylvania, Maryland, Wisconsin and California. According to the Ford Motor Co., this headlamp has been adopted as an attempt to co-operate with the owners and motor vehicle officials throughout the country, in an effort to provide a headlamp which will give ample road driving light and at the same time eliminate glare. The diagram herewith shows the illumination obtained in the New York tests and indicates that the equipment complies with both the light and anti-glare requirements. Inasmuch as the equipment can be manufactured for a few cents per lamp and at the same time gives an intensity in distribution of light which tests on candlepower to be more than what the law requires, it is expected that



Ford Green Visor headlamp installed



Shop layout for focusing and aligning Ford Green Visor headlamps

a big step in the direction of eliminating glare from the road has been taken. There are nearly 4,000,000 Ford cars on the road at the present time, and as the Ford car has been admittedly an offender from the standpoint of glare, a big stride in the direction of safety has probably been made.

The new Ford lamp comprises the standard Ford parabolic reflector with 1 3/4 in. focal length. The special green visor lens has the upper part painted green and extending 5/8 in. below the center of the lens and tapered back to a distance of 1 1/4 in. above the center line at each side. A special double filament bulb is supplied carrying a helical major filament, closely wound and 7-32 in. in length. This filament is specially focused with the filament drawn back of the focus center of the reflector until the front end of the filament is at the focus. The tip of the filament being at the focus center gives the direct beam required, while the remainder of the filament being behind the center gives the distribution of light to the sides of the lamp and for side illumination.

## HOW TO FOCUS

Standard adjusting directions have been supplied all dealers. A shop layout for focusing and aligning the lamps is shown in the sketch herewith. The empty car is put on a level surface in front of a white wall or screen 25 ft. from the front of the headlamps. This wall must be in semi-darkness or shielded from direct light sufficiently

\$1.00 — Instructions for Correct Focusing Given Here. Save This for Future Reference When Cars Are Brought in for Adjustment of Focus

that the light spots upon it from the headlamps can be clearly seen. The bright lights are turned on and the lamps focused by means of the set screw at the back of the lamps, first one lamp and then the other, drawing the bulb filament slightly back of the focal center of the reflector until a semi-circular spot of light is obtained on the wall, with the flat side up and with a concentrated circular central portion. In focusing, draw back the bulb to obtain as wide a spread as possible and still maintain the approximately flat top line and the concentrated central portion. In general, the spot of light when properly focused will be about 5 or 6 ft. in diameter, as measured across the top.

In aligning the headlamps, the headlamp brackets are bent so that the top lines of the bright spots on the 25 ft. wall are set at a line 28 in. above the level of the surface on which the car stands. The half cone of light from each headlamp is to extend straight forward; that is, the centers of the concentrated circular portions must be 28 in. apart. In assembling at the Ford plant, this is the last step taken before the cars leave the line.

## CARS IN DELAWARE INCREASE

Wilmington, Del., April 12.—Notwithstanding the dullness of the times, though the motor business appears to be taking on more life than some others, there are more motor cars in Delaware than ever before. This is shown by the January registration list, which has just been issued by Secretary of State Alden R. Benson, which shows a registration of upwards of 18,000. The highest number ever registered in Delaware before was a trifle over 16,000.



# EDITORIAL



## Poor Roads—Principal Disadvantage

**I**N the government's survey of the truck situation among eastern farmers and the advantages and disadvantages to truck usage as reported by the farmers themselves, the principal disadvantage under which the truck is laboring in that section of the country is shown to be "poor roads." And what is true in one section of the country, especially in a section where the roads are relatively good, is probably true in other sections.

If poor roads hinder the successful operation of a truck, from a profits earning standpoint, so do they hinder truck sales. If a truck has to remain idle "some time during the year when the roads are in such condition that motor trucks cannot be used" obviously it is not producing and a non-producing truck on a farm is not apt to be productive of future sales or an extension of the use of trucks by farmers.

To give entire satisfaction as a transportation medium on the farm the truck must be available at any time and those interested in the growth of the motor truck industry must lend their aid toward shaping conditions so that its availability may be possible from the beginning of the year to its end. Climatic conditions cannot be shaped but there is no limit to the efforts of persons interested in better roads either in the line of initiating a movement for improvement in any particular community or of backing a movement already started for roads that will bear up under any kind of weather and be passable the year round.

In the northern states snow is an element that must be met but there is a growing tendency to provide means for coping with the situation caused by heavy snowfalls. What is needed primarily to prevent other farmers—and nearly one-half of the eastern farmers so reported—from giving "poor roads as the reason for using horses; that is they found it necessary to use their horses for hauling which had to be done at a time when the conditions of the roads was such that their trucks could not be used" are good roads.

This is just one example to show how vital are good roads to the automotive industry and how necessary it is that everyone connected with that industry back with their full strength the movement for good and better roads throughout the country.



### The Telephone Salesman

**"U**SE your telephone to sell tires" says the B. F. Goodrich Rubber Co. This is a splendid sales suggestion. The thought has been frequently expressed that service could also be sold by the telephone, and with the further application of the idea of tires, accessories, cars and, in fact, everything that the dealer handles, the volume of sales could easily be increased very materially.

It is only natural that this system will produce results. Let us compare the relative sales force between a letter "with a punch" and a telephone call. The letter comes to your place of business and probably is opened by your stenographer. She glances over it and many times the ordinary letter is filed in the waste basket without ever coming to your desk. Those sales letters that you do see are glanced over hastily, after which they, too, are consigned to the waste basket. In general, a return of 25 per cent on letters of this kind would be exceedingly well.

Now consider the telephone salesman. He gains in practically an instant's time an introduction to you or whomever he calls. His story is told by word of mouth, and, if well told, will get an answer either Yes or No with the affirmative answers in the majority.

We recall the methods of an insurance salesman who secures his prospects by the use of the telephone. From a printed list he secures the name, telephone number and address of people in any one territory. He calls them up and not infrequently he is able to make nine appointments from ten telephone calls.

Dealers who have used the 'phone sales method have found it highly profitable for the time spent. Those who have not used the 'phone as a salesman will find it worth while to do so.



### Fire Prevention

**P**ROPER fire protection is something that is overlooked in many service stations and besides no particular precaution is taken to prevent fire. Fire will start from almost unbelievable causes and if conditions are not favorable for checking the flame disastrous results are likely to occur. The average service station has an accumulation of oil and grease on the floor all of the time which cannot very well be eliminated, but it is a paying proposition to prevent the oil and grease collecting in large enough amounts to be dangerous should fire break out.

Not enough attention is paid to the location of the cars when work is being done. A short time ago a fire occurred in one of the large service stations in Chicago as a result of a spark from the grinder igniting a very small amount of gasoline that had dripped on the floor. The cars were packed in close to the grinder and before the flame could be extinguished some damage resulted to the cars that could not be moved. In this case, fortunately, there were plenty of fire extinguishers at hand and the fire was put out before it got to a serious stage. A good thing to remember is, never start a job where there is any possibility of fire without a fire extinguisher at hand.



# No Overproduction By Makers

*While Michigan Plants Show Increased Number of Automobiles During March, Manufacturers Are Keeping Close Eye on Conditions and Will Restrict Output According to Demand*

**D**ETROIT, April 8—Speeding up marks the efforts in Detroit automobile factories and conditions resembling the 1920 period are apparent in the increased production total of 105,245 cars built in Michigan plants in March.

Naturally the sharp step-up in production has had its effect on parts factories, and wheels again are humming in those plants with production in degrees varying from 50 to 90 per cent of normal. The truck end also appears to have been affected by the optimistic feeling and the comeback in the passenger car end has marked a start toward quantity production in the truck factories. This is true especially in the Federal and Commerce plants which are working on a 60 per cent schedule.

Schedules for April production in all factories have been increased from 10 to 35 per cent, though executives of the most successful companies contend that the total output for 1921 will be between 50 and 60 per cent of 1920, which was regarded as an abnormal year and which production record probably never again will be reached.

Manufacturers are keeping a close eye on the conditions prevailing, and while there is an apparent inclination to take full advantage of the renewed demand, an attitude of caution is being maintained. The present decided improvement and indication of a continued upward movement will not serve to lead manufacturers from the beaten path as was the case in 1920. On the contrary they are going to maintain closer relations between the manufacturing and sales ends and restrict production to current requirements and reasonable future demand.

It is interesting in this connection to know that Ford output again is behind orders and three weeks is the limit now being fixed for delivery of new cars by Ford dealers in Michigan, Ohio and several other states.

## CADILLAC CALCULATES DEMAND AT 50 PER CENT OF NORMAL

Dodge Brothers swung into production in March and while the factory started on a 10 per cent basis, the output was increased rapidly each day until the plant now is on 60 per cent, which schedule will be maintained indefinitely. During the peak last year Dodge was building 625 cars a day, though the ordinary production was around 550.

Hudson which was reported as nearing 100 per cent, is increasing production and employee force rapidly, but still is far behind normal as regards output.

## How This Year Compares with Last

*SOME idea of the real situation in the Detroit territory may be gained by comparison with previous figures. In March, 1920, which marked a record to that time, thirty-three automobile plants, including the Overland and Willys-Knight factories in Toledo, produced 176,831 passenger cars. The output last month was 59.5 per cent of the March, 1920, total. Of the latter figure Overland and Willys-Knight production was 17,700 cars. Those factories have been down several months, resuming last Monday. Eliminating the output of those two factories for March, 1920, a comparison of figures reveals a production last month of 66 per cent of the 1920 total.*

*The increase last month over February was approximately 100 per cent, though this was in great measure due to the spurt at the Ford factory. Ford produced 35,000 cars in February and 72,000 in March. Excluding the Ford output, the actual increase in all other factories over February was 15,205 cars, or 84.3 per cent.*

Production at the Hudson and Essex plants last month was about 60 per cent of the peak last year. Studebaker is making great strides and at present is working on a schedule of 830 each week in the Detroit plant and 575 in South Bend. This is an average of about 265 cars daily in the two plants.

Basing calculations on dealer sales and forecasts, Cadillac Motor Car Co. has fixed a tentative schedule for the next few months approximating 50 per cent of normal. This schedule, Cadillac officials say will be adhered to strictly regardless of eventualities. It has been the policy to maintain a steady increase since January until the present output was reached, the factory reporting a big step-up in February and a slight increase in March.

Packard Motor Car Co. now is employing about 2,800 men and rapidly moving toward 100 per cent production. Packard comparisons as between 1920 and 1921, however, are impossible for the reason that production of the new Six was not started until late last summer. The plant turned out almost as many single Sixes last month as came through on the Twin Six model a year ago. A schedule of 1,000 single Sixes has been

fixed for April, with another step-up May 1st, if present conditions continue to improve.

Olds Motor Works at Lansing is hitting close to 100 per cent and production still is behind orders, officials say. Olds is turning out 100 a day of the new Four besides some Sixes and Eights. Reports from New England, the eastern, middle and west coast states indicate rapid improvement according to officials, who say the cotton states and the Iowa, Kansas and Nebraska corn belt and the far northwestern territory appear to be the sections unable as yet to recover from the depression.

Reo, which went down to a half-time, half-force basis March 21, is resuming normal conditions. A Reo official said the factory shipped 1,385 speed wagons and 904 passenger cars in March, the production exceeding shipments slightly. The curtailment during the last two weeks, officials said, was not due to sales recession but for factory and inventory readjustment. Inability to get passenger car bodies, it was said, was in a measure responsible for the slowing up. Retail sales in March, according to Reo officials, were better than during any month since last August.

Oakland Motor Car Co. at Pontiac, which resumed operations late in November, started on a 25-a-day production schedule Dec. 1 and increased steadily until in March the plant was on a 75-a-day basis. Oakland officials said they would move along at a conservative rate and would consider 50 per cent normal production throughout 1921 as a fair output. The company will manufacture in strict conformity to sales requirements and not attempt to create a surplus.

## BUICK RUNNING ON 5½-DAY SCHEDULE

Maxwell-Chalmers are stepping up on production schedules daily and in March turned out a total of 2,000 cars on the two models. This increased schedule was put into effect in April and Charles Adams, production manager, said he hoped to build 3,000 during the month on the two cars.

Hupp Motor Car Corp. finished the month of March with a record of more than 1,400 cars and has scheduled 2,000 for April with prospects for another increase May 1st.

Buick Motor Co. at Flint, which had been employing about 12,000 men on a 3-day-a-week basis started a 5½-day schedule about two weeks ago, and its April production is expected to be considerably increased. In fact, Buick, (Concluded on page 25.)

## Chain of Clearing Houses for Used Cars, Aim of Company

### Object to Eliminate Trading Evil by Appraising Trade In and Buying It Outright

SYRACUSE, N. Y., April 8—The United Used Car Corp., whose organizers propose to establish a chain of used car clearing houses in cities where groups of dealers desire this action, has been incorporated under the laws of Delaware and will have headquarters here.

B. W. Roberts, for several years head of the Used Car Exchange in this city, is active executive in the new corporation, with the titles of vice-president and treasurer. The authorized capital of the corporation is 20,000 shares of 7 per cent preferred, cumulative stock valued at \$2,000,000 and 40,000 shares of common stock of no par value.

The fundamental object of the plan is to eliminate the trading evil from the business of dealers who are members of local branches. Instead of making a new car purchaser an allowance on his used car, a dealer member of the corporation would send the used car owner to the clearing house, where his car would be appraised and purchased outright. The clearing house then would assume responsibilities for disposition of the used car and the former owner would have the cash in his hand to make his new car purchase, thus saving the new car dealer the necessity of tying up capital in used car stocks. Describing the corporation plan Roberts says:

#### Cars Appraised by Committee

"Under the plan of operation, each new car dealer sends to the clearing house, or local branch, the used cars that are offered to him as part payment on new cars. These cars are first appraised by a committee, regularly appointed for that work by the dealers and the corporation.

"The corporation buys or takes over each used car at its appraised value, provided same is satisfactory to the owner of the used car, and its age, etc., come within the provisions of the contract with dealers.

"Any owner may be unwilling to sell his car for the price agreed upon by the appraisers is privileged to consign same for sale, at his own price, with the consignment department of the clearing house, the owner being charged a commission on the sale.

"Each branch is operated as much as possible as a local enterprise. It deposits with a local bank, takes active part in local Board of Trade or Chamber of Commerce matters, if permitted, and when a local man can be found who is recommended by dealers for the position of resident manager, such a man is given first consideration. Each city where a branch is established also furnishes at least one man to serve on the advisory board of the corporation. Both the resident manager and the member of the

advisory board are expected to invest in the stock of the corporation.

"Dealers who cooperate with the clearing house are furnished with all necessary information and a plan of procedure for their guidance. They are also expected to take at least a small investment in the company's stock, which stock may be paid for in cash or by used cars, at their appraised value.

"In the event that 30 dealers cooperate with the clearing house in a city, it is possible and reasonable to suppose that during the year at least from 1,000 to 1,200 used cars will be offered to them for trade. In other words, if each dealer averages only 50 new car sales during the year, the total new car sales would amount to about 1,500 cars.

"It is safe to say that probably 75 per cent of the new car buyers will have a used car to trade in or to be disposed of in some other way. This would mean about 1,125 used cars for the year in that city.

#### Total Sales About \$1,000,000

"If these used cars are handled by the corporation and many of them are re-conditioned before being offered for sale, it is safe to assume that the total sales would amount to about \$1,000,000.

"The operating expenses of a branch, in any city where about 30 dealers would be cooperating, would probably not exceed \$65,000.

"The capital employed in a city of that size would probably amount to more than \$300,000.

"The company's capitalization will permit the establishing of probably 20 branches."

While Roberts' used car exchange in Syracuse has not been operated as a sub-organization of the dealers' association or even with association endorsement, it has bought and sold used cars for many members of the association over a period of several years. Both the outright purchase and the consignment plan have been used in the Syracuse exchange.

Roberts is now negotiating with dealer associations in several cities where interest has been shown in the corporation plan.

#### "SPEAKERS' HOUR" IN BALTIMORE

Baltimore, April 8—The Baltimore Automobile Trade Association has inaugurated a "Speakers' Hour," which is held in connection with the regular Wednesday luncheon.

During the time the new program has been in force the dealers have heard a number of distinguished speakers, including Governor Ritchie, General Gaither, commissioner of police, and State Highway Engineer Makall.

Governor Ritchie's appearance resulted in a cordial exchange of opinions between the governor and the dealers regarding legislation, taxes and the state's attitude toward the automotive industry. The Governor told the dealers he was anxious to have information which would lead to fair and just legislation and to proper expansion of the automotive industry.

## Oregon Senator Would Use Sales Tax for Better Roads

### System of Making Highways Appropriations Abolished Under Plan Affecting Automotive Products

WASHINGTON, April 8—Senator R. N. Stanfield of Oregon has prepared an amendment to the Federal highway bill providing that the receipts from sales taxes on automotive products should be used exclusively for the construction and maintenance of highways. This plan would abolish the present system of making highway appropriations out of general funds as called for under Federal aid legislation. Briefly, the proposal is a digest of plans advocated by automotive organizations for several years though there is no provision for a system of national highways.

Basing calculations on Treasury receipts for the last fiscal year, it is estimated that a sales tax would yield \$145,963,035.62. With the various tax proposals calling for a higher rate on automotive products a larger sum would be available under the Stanfield amendment. The Federal government under the Federal aid act has been appropriating \$100,000,000 for good roads. The distribution of this fund has provoked widespread opposition and the proposal for a national highway system was the outcome.

#### Good Roads Are Economy

According to the views expressed by the Oregon Senator "the users of motor vehicles receive direct money benefits from every mile of road improved in the form of decreased repair bills, extended life of the vehicle, increased mileage on tires, and gas and increased efficiency. Over poor roads this would be purely a waste. The saving of this waste invested in better roads is economy and good business on the part of motor owners, therefore, a tax imposed on the sales of equipment at its source is more than saved in the reduced cost of operation if the tax so collected is devoted to building more and better roads. True, lands and property other than motor vehicles receive benefits from highly improved roads but lands and other property also contribute to the common cause when they pay direct property taxes for the county roads which far exceed in mileage both state and national highways. Is not this the logical method for the government to provide funds for the carrying on of its part in this great highway program of the motor age?"

#### LOWER LICENSE FEES IN OHIO

Cleveland, April 8—Automobile license fees have been reduced in Ohio. A reduction of 25 per cent in the annual license fee was effective on April 1. The reduction was followed by a great increase in the number of licenses granted. It was apparent that a number of persons had been waiting for the lower price,



## Detroit Shows Disposition to Avoid Overproduction

### Automobile Factories Are Moving Toward Increased Schedules. Fewer Men Employed

(Concluded from page 23.)

which up to the first of April was building around 250 cars, expects to hit around 300 and 350 during April—in fact, the former figure already has been reached.

Dort Motor Car Co. built an average of 60 cars a day during March and has increased its schedule for April based entirely, officials say, on current demand. Chevrolet conditions also show an improvement. The same is true at Columbia, Liberty, Scripps-Booth, Saxon and the smaller companies throughout the state. The Paige factory, which is close to 100 per cent, is being hard put according to officials to keep pace with the sales demand. Paige has been increasing gradually since the plant resumed operations after Christmas, and while it was announced soon after the resumption that a production basis of about 60 per cent of normal would be maintained, demand throughout the country, it was said, prompted the step-up to 75 and then to 90 and now close to normal.

Clarence A. Earl, new president of Briscoe, said his company would maintain a schedule of about 20 cars a day for the next few weeks, but would increase gradually, and it was hoped to be on a 75 a day basis before the end of the summer. This, of course, is contingent, Mr. Earl said, on demand, but he declared he had every reason to believe from present indications that that quantity would be required.

Of much significance is the fact that employee forces have been curtailed to the minimum in all factories, and while many now are operating on a 60 per cent production schedule and some practically at normal, they are doing it with forces cut to a comparative basis of from 40 to 70 per cent. Despite the fact that all factories now in operation are hitting close to normal, many employees can be seen loitering around the factory gates and streets without work and with slight possibility of their securing re-employment. A high degree of efficiency reached and maintained, manufacturing executives declare, has solved the overhead in a great measure and is permitting operation at a profit in the face of production curtailment as compared with last year.

Many factories, in fact the majority, during the abnormal period were added to in the effort to speed up production, and with the prospect of maintaining the output of about 60 per cent of last years' figures or on a basis of close to pre-war normal, proper utilization of spare factory space and equipment now is a problem. The majority of manufacturers, however, are solving it by speeding up in the parts manufacturing end.

This is regarded as the logical plan and is certain to prove of great advantage to the owner in quicker and better service. When not driven to undue haste in turning out spare parts, as was the case last year, they necessarily will be turning out parts more nearly perfect as to quality and in a quantity sufficient to keep all dealer service stations well stocked. Some manufacturers also are contemplating side lines allied with the automobile, but no step in this direction has been taken.

## March Shipments Exceed February by 63 Per Cent

**NEW YORK, April 8**—From reports made to the N. A. C. C. by factories producing two-thirds of the total volume, indications are that for the month of March there were 16,500 carload shipments and 10,000 driveaways. Figuring the driveaways into carload equivalents the March shipping was 63 per cent greater than February. Last year this increase was 20 per cent. In March 1920 shipments amounted to 29,326 carloads and 57,273 driveaways, the largest single month's shipping; shipments for March this year will be 42 per cent of that record month.

Complete figures for February are 9,920 carloads, 7,491 driveaways and 99 boat shipments. This is an increase of 58 per cent over January. Last year this increase was 13 per cent.

## Future of Standard Parts to Be Taken Up at Creditors' Meeting

Cleveland, April 8—Something of a definite nature regarding the future of the Standard Parts Corp. is expected to develop at a meeting of the creditors of the company to be held at the Hollenden, April 12. This meeting has been called by F. H. Goff, president of the Cleveland Trust Co., who is chairman of the creditors committee.

Reports from Franck A. Scott and J. O. Eaton, receivers, will be submitted, as well as a report from the creditors' committee. The whole situation will be thrown open for discussion as to the proper course to pursue. It is understood that a plan will be submitted by the creditors committee for lifting the receivership at this meeting.

### PARADE OPENS SHOW

Terre Haute, Ind., April 8—Twenty-four different makes of automobiles are being shown this week at the automobile show staged by the Terre Haute Auto Trade Association in the new building of the E. W. Steinhart Co. here. In addition accessory men have many unique displays. The exhibit opened following a long automobile parade around the chief business streets of the city.

## Wisconsin Factories Feeling Effect of Business Revival

### Parts Makers Find It Necessary to Increase Production Schedules and Working Force

**MILWAUKEE, April 11**—A marked revival of passenger cars as well as motor truck sales in all sections of the country is being reflected into the automotive parts and equipment industries of Milwaukee to the extent that these industries are now in the lead in percentage of operations among all manufacturing groups. Especially since April 1 has it been necessary to extend operating schedules and re-employ men to meet the growing demand for parts and equipment. It is now confidently predicted that normal will be reached before midsummer.

B. W. Twyman, general manager of the four cylinder car division of the Nash Motors Co. at Milwaukee, said this operation is now on a 100 per cent production basis, and shipping 20 cars daily. Additions now under construction and contemplated for the summer will bring the capacity to 50 cars a day. The main Nash plant at Kenosha, Wis., increased its force by nearly 300 men in the last week and is operating at 66 2/3 per cent of capacity. Production will be on a 75 per cent basis by the end of the month. Normal production is 160 cars a day.

John Tainsh, general sales manager of Mitchell at Racine, says that a shortage of passenger cars by midsummer is not beyond the range of possibility. Mitchell is operating between 50 and 60 per cent of capacity, and with the demand picking up in all sections, save some parts of the south and northwest, production is gradually being enlarged.

Kissel at Hartford, Wis., is producing on a basis of 60 per cent of normal and is adding men every day as the spring demand for cars becomes more and more pronounced.

Fred L. Good, factory sales manager of the Ogren Motor Car Co., Milwaukee, said the plant is sold up to June 1 and new business is being received at a rate guaranteeing capacity production beyond that date.

The Interstate Drop Forge Co., Milwaukee, specializing in automotive forgings, is the high light among local manufacturers, as it is operating 24 hours a day in three shifts and employing the full capacity, with eight hammers. It is filling orders from Ford, Hudson, Scripps-Booth and other factories, reflecting renewed activity in motor car plants at Detroit and other centers.

Herbert A. Githens, sales manager of the Federal Rubber Co., Cudahy, suburb of Milwaukee, says the tire business has entered a new period of prosperity, and that within five or six weeks it probably will require full capacity. The Cudahy works extended operations from three days a week to five days during the past week.

## No Salesroom for Prospects; but Sells 200 Cars in Month

**Dealer and Eight Salesmen Conduct  
Sales Campaign on Purely  
Personal Basis**

**D**ETROIT, April 8—C. C. Starkweather, Buick dealer in Detroit, was host Wednesday to a party of more than 200 Detroiters, including seventy-five persons who purchased Buick cars from Starkweather at the Detroit show. The occasion was a visit to the Buick Motor Co. plant at Flint, where the seventy-five cars were tagged and ready for the owners to be driven back in the afternoon. Starkweather, who is one of the oldest Buick dealers and who has the distinction of selling as many cars as any other dealer in the Buick organization without maintaining a showroom, sold seventy-eight cars at the show. Three of the purchasers, however, are out of the city and were unable to join the party.

As further evidence of the intensive efforts of the Starkweather organization, it is announced that sales to date, including the Detroit show sales, indicated that for the month from March 15 to April 15 the organization will have sold more than 200 Buick cars of various types. This is considered remarkable by dealers and factory executives in the fact that the Starkweather organization conducts its sales campaigns on a strictly personal basis and has nothing in the way of a showroom by which to attract prospects. Starkweather himself is one of the most widely known men in Detroit, having served several years as a grocery drummer before he became connected with the Buick organization more than fourteen years ago.

For a time the Owen, Graham & Starkweather showroom was divided between General Motors trucks and Buick cars, but more than a year ago Starkweather gave up the showroom and since has conducted his organization from a small office with three or four desks, practically eliminating the enormous overhead that is the problem of the average dealer.

Starkweather is a native of Detroit, and through his wide acquaintance, together with that of his eight salesmen, he digs up the prospects, who are then taken to the Buick branch showroom for a look at the car and for a demonstration. He is prominent in the Masonic lodge and the Elks, and formerly was head of the Michigan Commercial Travelers' Association, accounting in great measure for his wide acquaintance and popularity, which enables him to compete successfully with practically no overhead.

### SENATOR PLEADS FOR INDUSTRY

Rushville, Ind., April 8—Fifty automotive dealers of Rush county heard Senator Walter McConaha of Richmond urge the necessity for fair treatment of the automotive industry at the hands of the

legislatures. Senator McConaha proved a friend to the industry in the 1921 sessions, and said that the industry had as few supporters as it did because the automotive business men made no effort to win their friendship. "The automotive industry asks no especial or particular favors," said Senator McConaha, "but it is entitled to a fair deal. About the only thing the industry would ask is to be let alone."

## "Auto-Apartments"—Chain of Garages Through Country

New York, April 8—The Ramp Buildings Corp. of this city has completed plans for two chains of garages, one to be located in Greater New York and the other in the Mississippi and Missouri valley, and will go forward with them simultaneously. The chain in the Greater New York section will be known as the Auto Apartments, Inc., of Greater New York, and will consist of several garages in the metropolitan district, the first link serving the fashionable Park avenue territory. The other chain will carry the name of Auto Apartments, Inc., of the Mississippi and Missouri Valley, and will have headquarters in Kansas City, the first station catering to the business and shopping patronage.

The companies will operate as subsidiaries of the Ramp Buildings Corp., similar companies later being established in the Chicago territory, with the expectation that ultimately the entire country will be linked together with these garages.

## County Dealers Contemplate Uniform Plan for Used Cars

Rushville, Ind., April 11—Adoption of a uniform plan for the handling of used cars, time sales of motor vehicles, and a meeting with the bankers of Rushville will be undertaken immediately by the Rush County Auto Trade Association, as a result of an address here by L. M. Shaw, secretary-manager of the Indiana Automotive Trade Association.

The meeting was called as a preliminary to completing the work of organizing county associations throughout the Sixth congressional district. Several applications were taken and the congressional council organized. Formation of organizations in three remaining counties in the district will be undertaken by the congressional district council. This is expected to be the first congressional district completely organized.

### LOUIS DISBROW LEAVES TRACK

Chicago, April 8—Louis Disbrow, former dirt track racing car driver, has left the track for business, assuming the position of district distributor for Rajo valve-in-heads and other Rajo improvements for Fords in the states of Illinois, Iowa, Indiana and Michigan. His headquarters will be at 2118 Michigan avenue, this city. The Rajo products are made by the Rajo Motor Co., Racine, Wis.

## Northwest Credit Conditions Improved, but Not Yet Normal

**Business in Minnesota Is Looking  
Up—Country Districts Still  
Remain Backward**

**M**INNEAPOLIS, April 8—That the automobile business is looking up in Minneapolis territory is evident. Dealers are beginning to smile and old man Gloom is being dispelled. Business in the larger cities such as Duluth, St. Paul and Minneapolis is the first to look up. As for the country not so much can be said as yet. Possibly one reason for the situation is that the driving season in the country will not begin in earnest until the winter's mud has been dispelled. The financial situation is not such yet that country dealers can get the cars they want. The truck men feel pretty good because hundreds of road and other contractors are feeling the return of the building season, after a long lapse. The tractor situation is not so bright.

Northwest credit conditions have improved in the last six months but are not at normal. Of the total accommodation by the federal reserve bank in the district March 4 loans were largely agricultural, or \$41,000,000. There is more unemployment, and a decline in both wholesale and retail prices of commodities is shown from Feb. 1 to March 18.

Confidence seems to prevail as the northwest enters the new crop season. In parts of North Dakota and Montana farmers cannot repay loans until the new crop is harvested. In other parts, say South Dakota and Minnesota, farmers can liquidate heavily when they release their present holdings of grain. The new wheat area is reduced somewhat but the total grain crop averages may go above normal.

The Pence Automobile Co., one of the first to receive big shipments of cars, the Buick, has received from the new St. Louis factory three trains of 38, 39 and 55 freight cars each. The load is four automobiles a car. Actual offers for more than half of the total have been received already. The first train made the trip from the factory by daylight, stopping as optimism creator at Mexico, Moberly, Macon, Moulton, Wis.; Des Moines and Oelwein, Ia.; Northfield, Minn. From the latter point the freight was hauled over the electric line of which H. E. Pence is president.

### FORDS NOT FORDSONS AT TROY

Troy, N. Y., April 8—After inspecting the site at Green Island on which he will build a large plant, Henry Ford stated it was quite likely the factory would be used for the manufacture of automobiles rather than tractors as has been predicted. He added that Thomas A. Edison would construct a plant adjacent to the Ford factory which will be operated by power taken from the Ford power house.



## Somebody Is Getting Business— Let's Go

**NEW YORK, April 8**—Sales managers who are mourning because "there is no business" might do well to go off in a corner and quietly consider these facts:

Business today, in spite of all reports to the contrary, is moving at a pace only 20 per cent slower than that of a year ago.

General sales in the United States for January, 1920, amounted to \$45,178,711,000. This was considered a phenomenal showing.

Notwithstanding the "depression" sales in January, 1921, amounted to \$38,506,907,000. This was 85.3 per cent of the business done a year ago.

Bradstreet's commodity index shows a 43 per cent decrease in prices over the same period a year ago, and since the country is doing 85 per cent as much business in dollars as it did a year ago, the figures indicate an increase rather than a decrease in the number of sales.

Somebody is getting this business. More business is being done by some organizations than they ever did before.

The sales manager who is waiting with folded arms for "better times" and charging small sales to stagnant business conditions, might well adopt this motto: "Let's Go!"

## Greater Tire Production and More Men at Akron Factories

### Resumption of Operations by Automobile Plants Responsible for Stimulated Activity

**AKRON, O., April 8**—With many automobile factories resuming operations, and with the vast surplus of tires of two months ago almost completely exhausted, marked improvement is being shown in the tire industry and Akron's many rubber and tire factories have begun to recover encouragingly from the slump which has been in force for the past nine months.

Nearly all Akron factories have commenced to increase production and many are re-employing men on a large scale. This week the Goodyear Tire & Rubber Co. will put on 1,200 of its former employees, and The Firestone Tire & Rubber Co. will re-employ 1,000. Firestone has been adding to its force every day for the past few weeks and for the period extending from March 1 to April 30, will have re-employed at least 2,000 men, officials announce.

The Goodyear company has formally announced a 33 per cent increase in production, effective at once, which will carry production up from 12,000 casings and 13,000 tubes daily to 16,000 casings and 16,000 tubes a day. Firestone will increase production 50 per cent this month and go to 16,000 tires daily. Both factories are running two eight-hour shifts daily, and operating on five-day weeks. Goodyear soon will go to a five and one-half-day week.

These two companies unquestionably are leading in the spurt taken by the tire industry. The other large companies of Akron, Goodrich and Miller, have made no formal announcement of production increases or re-employment of former tire builders. Smaller companies however are falling in line and several of them have restored operations to a basis of nearly 100 per cent normal.

In fact everything indicates that the backbone of the tire industry slump in Akron, which threw over 50,000 out of work in this city alone, has at last been broken. It is also significant that unless tire companies plan further production increases, the possibilities of an actual tire shortage this spring will be greatly increased. Vast surplus stocks of tires, stored in Akron and in other cities by Akron companies, have dwindled rapidly, through production being held down the sales have steadily increased. With this surplus exhausted, rubber factories are now ready to get back to a basis of conservative production commensurate with demand.

Resumption of operations by automobile factories, is perhaps predominantly responsible for the stimulated tire building activity. Goodyear alone reports that original equipment orders for April show an increase of 70 per cent over original equipment business placed in March.

## Part of Regiment Is Adopted by Des Moines Motor Trades

**Des Moines, April 8**—Members of the motor trades in Des Moines took a prominent part in recruiting men for Company C of the 168th Regiment, Iowa National Guard, which is to replace for peace times the famous regiment which was a part of the Rainbow division and which distinguished itself at Chateau Thierry and a number of other world war engagements. Four companies of the newly organized regiment are to be located in Des Moines and different business organizations are adopting the various companies and are to make them their special subject of attention.

The Motor Trades Bureau of the Chamber of Commerce adopted Company C., of which Don Harrison, a member of the bureau, is commanding officer. The bureau furnished lists of employees to the recruiting officers and in every way possible aided in filling the ranks of the company.

## Studebaker Wants to Produce 20,000 Cars Second Quarter

### Denial Made to Stockholders That Durant Has Obtained Control of Corporation

"The sales of our cars for delivery in the months of April, May and June are far in excess of any previous year in our history, and we are trying to increase production at all plants with the expectation of producing and selling 20,000 cars in the second quarter."—Statement by President Erskine of Studebaker Corp. to stockholders.

**NEW YORK, April 8**—Official denial that control of the Studebaker Corp. now rested with W. C. Durant, F. S. Fish, chairman of the board and himself, was made by A. R. Erskine, president of the company, in a statement read at the annual meeting of the stockholders held in Jersey City. After referring to newspaper reports to this effect, Erskine said:

"I feel it my duty to inform our stockholders that there is not the slightest foundation for such reports. We know of no interests that are trying to obtain control of the corporation and believe such an undertaking to be extremely unlikely.

"We have not been, nor will we be, interested in acquiring a controlling interest in the stock of the corporation. In fact, such an effort by anyone would in our judgment be hostile to the best interests of the corporation, its customers and its stockholders. We prefer to see the number of our stockholders increase, with the widest possible distribution of our stock, and to this end we shall continue to manage the affairs of the corporation in a manner that we hope will deserve the continued confidence of the automobile and security buying public. During the past year, the number of stockholders increased from 3000 to 12,000, including 3000 employee stockholders."

Highly significant of the conditions now prevailing in the industry is the statement of Erskine to the stockholders that the company has been able to reduce its bank loans materially and that orders for the second quarter assure the largest three months' business in the history of the corporation.

### WITH SPRING COME DRIVEAWAYS

**Detroit, April 12**—Truck manufacturers throughout Michigan have been taking advantage of the open roads for truck driveaways in the last week. Acme Motor Truck Co. of Cadillac has staged driveaways to Grand Rapids, Detroit and many other points in the southern part of the state. Last week a fleet of four trucks consisting of three 2-ton gravel dump jobs and a 1½-ton chassis were driven to Grand Rapids. Other companies are taking advantage of the very pleasant weather and the good roads, and are using the overland route wherever possible for making deliveries.

## Service Stations Will Handle Sales of Monitor Cars in Ohio

**Distributors to Be Named in Principal Centers and May Fix Selling Price**

COLUMBUS, April 8—Under a new system of merchandising its product, the Monitor Motor Car Co., manufacturers of the Monitor motor car, will handle its sales and service in Ohio through a chain of one hundred service stations under the direct supervision of the manufacturer. While each service station will carry a stock of service parts it is not required to carry a stock of cars. The manufacturer furnishes a book of coupons with each car entitling the purchaser to fifty hours of mechanical service at any Monitor service station. The manufacturer also pays all advertising expense in the state.

Distributing contracts in the principal distributing centers are being placed with old established organizations. The manufacturer has developed a plan for furnishing cars to the distributing organization at a net price and the distributor has unlimited freedom and opportunity in developing a merchandising plan, according to his own ideas, organization and financial resources. It is anticipated that there will be a smaller number of distributors covering larger territory, operating under long-time contract and having the opportunity of determining the sales price, discount, handling charges and all other details connected directly and indirectly with the business in his territory. It is also anticipated that he will have a better opportunity of developing a used car exchange for handling cars taken as trade-ins, as the new system of merchandising takes into consideration every phase of buying, selling and financing automobiles as merchandise.

### Distributor May Set Price

Under this plan the large distributor who has a thorough working organization and is able to operate at a minimum of overhead expense will have a distinct advantage over competition in the large distributing centers and will also be placed in a position of particular advantage because of being able to buy on a net basis and being able to determine the selling price for the territory under his control.

Co-ordination of the different distributing representatives will be arranged and maintained through the manufacturer. One meeting each quarter of the year will be held at the factory for the purpose of discussing conditions to be met and for the exchange of ideas and suggestions for the general good of the entire sales organization.

The system offers entire freedom in operation for the distributor and offers a premium in the way of additional net profit for economical management of the distributing business.

The Monitor factory has not been closed during the fall or winter, having

maintained a moderate production during that time. Production will be increased as rapidly as the sales conditions justify.

Washington, April 8—President Harding presented the Firestone scholarship to Miss Katherine Butterfield of Weiser, Idaho, winner of the essay contest on highways and highway transportation in which 225,000 contestants were entered. It was also announced by Harvey S. Firestone, donor of the prize, that a similar scholarship would be awarded next year with the Highway Transport Committee as judges. This committee accompanied the prize winner to the White House.

## Dealer Territory for Durant Not Yet Ready to Be Allotted

New York, April 8—Durant Motors, Inc., has been chartered in Delaware to succeed Durant Motors, Inc., the New York company formed by W. C. Durant to mark his re-entry into the automobile field. The capital of the Delaware corporation is 1,000,000 shares of no par value stock.

The first of the Durant experimental cars have come through and are now being given thorough tests on the road. It will be August at the earliest, however, before they are put into production. Dealer territory will not be allotted for several months yet.

It has been announced that one of the Durant Motors assembling plants will be located at Jackson, Mich.

## Former Tex. Dealer Takes Over Dodge Dealership in Cleveland

Cleveland, April 8—An important development in automobile retail circles has been made known by the announcement that the W. Pitt Barnes Motor Co. has been chosen as Dodge dealer for the Cleveland territory. The new concern takes over the \$700,000 plant completed a few months ago by T. H. Towell, former Dodge dealer, who is now devoting his time exclusively to the Cadillac agency. For some time Mr. Towell had been local dealer for the Cadillac and Dodge.

The new dealership is a partnership which is headed by W. Pitt Barnes, who came to this city from Houston, Tex., where he was a Dodge dealer. F. E. Richardson, former sales manager with the Towell Dodge organization, is another partner, and so is Mrs. M. Carroll.

### MEXICANS CROSS BORDER TO SHOW

Brownsville, Texas, April 8—The Rio Grande Valley automobile show was held here during the carnival recently. Dealers from every section of the lower Rio Grande were in attendance. One feature of the attendance was the number of Mexicans who came across the river to see the new cars. Dealers along the Rio Grande say that the show has helped business in the adjacent Mexican territory. The displays, in addition to automobiles, consisted of trucks, tractors, trailers, tires and accessories and parts.

## Congressman Good's Fellow Townsmen Protest His Views

**Take Exception to His Tax Proposal and Classification of Automobile as Luxury**

CEDAR RAPIDS, IA., April 8—Declaring that the automotive industry is "already overburdened with tax," automotive men of Cedar Rapids, the home town of representative James W. Good, have risen in protest against the wheel tax proposed by the congressman and against his views on the automobile as a "luxury." The Linn County Motor Trades Bureau has written him a letter of protest and similar letters have been sent by every garage owner, automobile dealer and truck dealer in the city and county.

"We do not think it possible that anyone at the present time would consider the automobile a luxury," E. L. McKibben, the president of the bureau, has written.

"We are very much opposed to a tax of this nature as the automobile industry is already overburdened with tax.

"In 1920 the automobile industry paid a Federal tax of \$44,000,000, license and registration fees to the state governments of \$1,000,000, and a personal tax exceeding \$80,000,000; a total tax exceeding \$325,000,000. To this excess burden you now propose to add another \$200,000,000.

"You, being an Iowan, must realize what a value automobiles are to Iowa farmers and what a wonderful blessing they have been to Iowa farmers' families."

Other letters from individuals voice their "vigorous opposition to this measure and consider that the automobile industry at the present time is over-taxed," and show how business has been built up around automotive vehicles, removing it from the "luxury" classification.

## Paige Dealers Participate in National Demonstration Week

Detroit, April 8—Paige Motor Car Co. dealers throughout the United States are participating in a national demonstration week which began Monday. With all of the larger shows past, factory executives decided that the time was most opportune for a spring salon and a real Paige show in each city at the Paige salesrooms.

Every salesroom has been decorated for the occasion and given a showy atmosphere. Invitations have been sent broadcast to owners and prospective buyers by the various dealers and competent mechanics are on hand at all of the dealers' stations to demonstrate and explain the engine and construction, while salesmen are driving visitors around the city for demonstrations.

The Paige factory is working practically full time in anticipation of renewed demand that is expected to result.



## Jimmy Murphy Wins Beverly Hills Sprint Championship

**Track Record Boosted to 109 3/5 Miles Per Hour for Fifty Miles**

LOS ANGELES, April 10—Boosting the track record up to 109 3/5 miles per hour for 50 miles, Jimmy Murphy won the sprint championship at Beverly Hills speedway this afternoon. Sarles was second; Pullen, third and Hearne, fourth. The other starters were De Palma and Thomas.

Murphy's time for the forty laps was 27 minutes 27 seconds.

It was a wonderful race. De Palma took the lead in the first lap but was forced to the pits in the eleventh with his car in flames. Murphy then went out in front and was not overtaken again. De Palma started again fifteen laps behind and drove at 112 miles per hour, the fastest made but was only in the thirtieth lap when the race ended. His car was flaming then.

### De Palma Has Bad Luck

Preceding the 50 mile event there were four heats of 25 miles each. De Palma won the first averaging 106 2/10 miles per hour; Pullen, the second at 107 9/10; Thomas, the third at 105 8/10 and Murphy, the fourth at 107 3/10. In the four heats Sarles won second three times and Hearne a second and two-thirds. Milton took one-third place but this did not qualify him for the finals. Murphy went out in the first two heats and did not start in the third, taking the opportunity to tear down and re-assemble his motor. This gave him added speed and enabled him to win when De Palma's proverbial bad luck overtook him.

De Palma drove a Ballot; Hearne, a Revere; Sarles, a Monroe and all the rest Duesenbergs.

### FINANCING COMPANY FOR EL PASO

El Paso, Texas, April 8—El Paso has a new venture in the automobile world. It is the Automobile Mortgage Co., capitalized at \$100,000 and having for its purpose the financing of automobile dealers and purchasers in stocking of automobiles. It starts business with the

backing of some of the largest distributing agencies in the city and will handle all notes and mortgages connected with the purchase of an automobile from the factory to the ultimate payment by the purchaser. The company is planning to do a general motor car financing business throughout the Southwest. Roy G. Martin is president of the company. C. H. Kimbrough is treasurer.

## Chamberlain Opens First of Series of Schools on Service

Tampa, Fla., April 8—P. E. Chamberlain, formerly general manager of the R. R. Hall Cadillac Co. of Denver, and recently a speaker on automobile service subjects for the National Automobile Dealers Association, conducted here the first of a series of schools on service to be held in cities throughout the south and later, perhaps, in other sections of the country.

Chamberlain had as students here a large class of young men from both the sales and service departments of Tampa and vicinity businesses. Among them were 15 men, including three executives, from the automotive equipment jobbing house of Baughman. Chamberlain took up the organization of an automotive business and then presented its obligations to the public, covering the various service angles, and the relation of the various departments to them. The course consisted of six lectures.

### HENRY COUNTY NAMES OFFICERS

Kewanee, Ill., April 8—Henry County Automotive Trade Association members have elected the following officers: William Soderburg, president; C. S. Moberg, vice president; Phil Miller, treasurer and Frank Brown and William Hedstrom, board members.

### EMPLOYEES MEET MONTHLY

Terre Haute, Ind., April 8—The Nichols Motor Co. of this city has inaugurated a new system of monthly get-together meetings for the entire force of the company. The meetings will be both in the nature of social and business affairs and all difficulties experienced by any of the force may be brought up freely at any of these meetings.

## Tractor Production Program Enlarged by Twin-City Maker

**Demand Is Good in Sections Where Crops Matured Early Last Year**

MINNEAPOLIS, April 9—As a part of an enlarged program for the manufacture of tractors, the Minneapolis Steel & Machinery Co. re-opened its foundry this week. One hundred to 200 additional men will be employed, this number to be increased gradually.

"We have an order for every tractor we have made," says George M. Gillette, president. "Our people feel that the business situation is greatly improved. Trade is far beyond the expectations of sixty days ago."

Demand for tractors for spring farm work is good in sections where the crops matured early last year and where the growers had the opportunity of seeding before the slump in the price of farm products came, Mr. Gillette says.

### Tractor Business Generally Good

Other tractor firms in Minneapolis report good business.

The Shaw Enocks Tractor Co. is operating its plant on a twenty-four hour basis turning out tractors for road maintenance work. Many of these machines are being sold direct to county commissioners.

Reports received from dealers indicate that there will be a marked improvement in the demand for tractors after the first of the month, according to R. C. Brewsaugh, sales manager of the Toro Motor Company.

### SHOE MEN FORM MOTORBUS LINE

Minneapolis, April 12—A novel feature of a new and the largest motorbus line out of the twin cities is that its officers are all from the shoe industry. It is the New Era Transportation Co. and it operates buses costing \$18,000 each between St. Paul and Owatonna, Minn., in three hours. The Jefferson Highway is followed. The maximum fare is \$2.65 one way. Harold L. Miles is president, J. J. Goetzenber is vice president and Murray Bender is secretary-treasurer. The home office is Faribault, Minn.



In order to find out how their cars would perform over practically every kind of road, The Southern Motor Manufacturing Association, Houston, Texas, builders of the Ranger car, recently staged an endurance run of 3600 miles covering eight states. Left—Ranger car No. 2 fording the Duck river, 10 miles from Columbia, Tenn. Center—Ranger No. 1 in mud hub deep between Oklahoma City and Okemah, Okla., slow going but the car pulled through. Right—No. 2 Ranger has just negotiated an emergency bridge on the road between Helena and Clarendon, Ark.

## Conservative Optimism, Note Sounded by Reeves in Address

**Salesmen Doing Harder Work, N. A. C. C. General Manager Tells Philadelphia Associations**

PHILADELPHIA, April 8—Automobile salesmen are doing harder work than they have done for a year or two and the industry is on the upward trend, according to Alfred Reeves, general manager of the National Automobile Chamber of Commerce. Mr. Reeves spoke at a luncheon given by the Philadelphia Automobile Trade Association to its members and those of the Motor Truck Association of Philadelphia and the Automobile Accessories Business Association.

Mr. Reeves sounded a note of "conservative optimism," and stated positively that the trade is rapidly recovering from the period of depression that has generally affected all lines of business. He made a plea for the support of the industry by legislators in framing fair laws, and by the financial interests of the country in giving the industry at large the support it deserves and requires because of its importance as a transportation factor.

Nearly 400 men, including numerous bankers and leading business men attended. Louis C. Block, president of the Automobile Trade Association, attended.

### Show Attendance Broke Records

Mr. Reeves said that "The best evidence of the upward trend of the automobile industry was the record-breaking attendance of the automobile show here and in other cities, with the exception of New York and Rochester, for which there were local reasons. These shows gave a stimulus to the business which is being felt daily.

"The automobile industry was among the first to be affected by the depression and is now the first to make the upward turn. Wire reports to the manufacturers' headquarters from fifteen sections of the country where shows have been held, all indicate a decidedly upward trend of sales. Trade is poor in the south and in Dakota, awaiting the marketing of farm products; but in all other sections of the country sales are getting into their spring stride.

"There have been many good sales, with a long list of prospects scheduled. Salesmen are doing hard work. The trouble, it appears, has not been worry over the hard times that are coming, but over the soft times that are going. This upward turn in our industry means that, as in 1907, 1914 and 1919, the automobile industry first feels the public's pulse and will lead in the return of prosperity."

### NEW COMPANY FOR REVERE

For Wayne, Ind., April 8—An entirely new company will be organized to take over the plant of the Revere Motor Car Corp., of Logansport, according to the plans of the committee recently ap-

pointed to formulate plans for the future of the plant. It is proposed to have the new company purchase the plant at a receiver's sale. This committee consists of Judge R. D. Gentzel, of Chicago; Senator P. S. Armatage, of Owensville, Ind.; H. C. Springer, Garrett, Ind.; L. C. Thompson, Trenton, N. J., and John Miller and H. A. Kraut, of Logansport. Copies of the plans for the future of the company have been mailed to all stockholders of the present company and an invitation extended to all to become stockholders in the proposed new corporation.

## Victor Output of Tires and Mats is Speeded Up to Normal

Springfield, O., April 8—Starting last Monday, the Victor Rubber Co. speeded up its output to normal basis of 500 cord tires a day according to announcement made by Treasurer H. H. Durr. Since the first of the year the company has been turning out an average of 400 tires daily. The business of the company has been steadily improving, it is stated. There is a general demand for tires and the prospects "are very good," Mr. Durr says. The rubber mat department started on a 2,000 a day schedule Monday for the Ford Motor Co.

## Cash Sales as Result of Show Held in Uniontown, \$200,000

Uniontown, Pa., April 8—The Uniontown Automotive Association took an important step forward at its second annual dinner, sequel to the highly successful automobile show held in March. Summed up, the event was:

A plea for the exercise of the Golden Rule in business.

A plea for a hearty cooperation as manifested in the show to extend into every branch of the automotive industry.

The fact that this is no time for pessimism; that the future of the industry bears more promise than ever before; that the industry is improving rapidly; that there is adequate financial backing in the banks for all legitimate enterprises; that success now must come through hard work, initiative and enterprise and service to your customers.

Speakers of the evening were B. W. Ruark of Pittsburgh, sales manager of the Pittsburgh Auto Equipment Co.; A. L. Kaltenborn of Pittsburgh; R. M. Fry, coal and coke operator, of Uniontown; W. C. Black of the Citizens Title & Trust Co., this city. Leo W. Reed, vice-president, in the absence of J. Q. Adams, president, because of illness, presided at the dinner. George B. Smith, secretary-treasurer, reported that cash sales as the result of the recent automotive show had already totaled \$200,000.

### MAIL BLANKS FOR UNIONTOWN RACE

Uniontown, Pa., April 8—Entry blanks went into the mails today for the Universal trophy race at the Uniontown Speedway, Saturday afternoon, June 18, 1921. The distance will be 225 miles.

## Three Events Scheduled for Pikes Peak Races Held Sept. 5

**Penrose Cup Offered to Car Making Best Time to Summit of Mountain**

COLORADO SPRINGS, Colo., April 7—The Pikes Peak automobile races for the \$2,000 Penrose cup and cash prizes aggregating \$2,100, will be held this year on Sept. 5 over the same course as previously from the Crystal Creek bridge to the summit of Pikes Peak, approximately 12 miles, 2,200 feet with a flying start not to exceed 200 yards.

The events are under the rules and with the sanction of the contest board of the American Automobile Association. The entry blanks properly certified must be in the office of the Pikes Peak Automobile Highway Co. at Colorado Springs not later than Aug. 8. Drivers have the option of carrying a mechanic. The races are divided into three events and the drivers go against time.

Event No. 1—Open to A. A. A. Classification Class "C" cars, with a piston displacement of 183 cubic inches or less. Prizes, cash: First, \$500; second, \$200.

Event No. 2—Open to A. A. A. Classification Class "C" cars, with a piston displacement of 183 to 300 cubic inches. Prizes, cash: First, \$500; second, \$200.

Event No. 3—Open to A. A. A. Classification Class "D" cars, with a piston displacement over 300 cubic inches. Prizes, cash: First, \$500; second, \$200.

To the car making the best time regardless of class or event entered in, goes the Penrose Trophy under the term of the deed of gift. The cup is silver and gold standing 45 inches high.

The summit of Pikes Peak, the goal of the drivers, is at an altitude of 14,109 feet reached by a boulevard 20 to 50 feet wide with easy curves and fair grade.

The races are being staged at the same time as the Colorado Springs carnival which includes airplane races from Denver to Colorado Springs, circling the top of Pikes Peak, and a polo tournament of the championship of the west and the Foxhall Keene cup at the country club on Broadmoor.

## Gets Trainload of Trucks and Cars; Asks Factory for More

Hartford, Conn., April 8—With a trainload of passenger car and speed wagons delivered Russell P. Taber, Inc., of this city, state distributor of Reos, finds itself in the position of needing more cars badly to fill orders. There are sixty-eight additional orders to be filled and in an endeavor to get machines to take care of these orders Russell P. Taber, head of the house, made a special trip to Lansing. He will not be able to get another trainload immediately but the factory has given him every assurance of carload shipments at least twice a week. The Tabor organization has led the city of Hartford in the matter of sales for the past few months. A good volume of business was maintained last winter.



## "Spirit of Transportation" Paintings on Western Tour

**Ezra V. Clark Accompanies Them,  
Holding Meetings in Connection  
With Dealers' Associations**

ST. LOUIS, April 8—The National Automobile Dealers' Association as a step in a further drive on the people of the West to show the utilitarian value of motor transportation has sent into the western states Ezra V. Clark of the Clark equipment companies with the series of paintings which formed a distinct feature of the national automobile shows and which depict the "Spirit of Transportation." Visits will be paid to Portland, Sacramento, San Francisco, Los Angeles, San Diego, Salt Lake City, Denver and Omaha. During Mr. Clark's stay in each city private exhibitions of the pictures will be arranged for art students of schools and universities and art societies. He will hold meetings in connection with the local automobile dealers' associations in each city.

The tour is designed to accomplish four things. First, to give the dealer a view of the broad and important service he is rendering to the community, linking his activities with the industrial activities of his city; second, to crystallize in the community the sentiment of the substantial business men that industrial activity is increasing and that business is getting better; third, that there are abundant resources for the financing of legitimate business and that the automobile business is not only a legitimate business but an absolute necessity and that it must be provided with ample credits to care for its growing needs; fourth, to establish in the public mind a knowledge of the importance of the automotive industry as a creator of a new system of transportation as vitally important to the nation as the railroads.

Mr. Clark will emphasize that the public welfare demands that this industry be treated fairly and justly in matters of taxation and legislation, that hard surfaced roads are as necessary to the progress of a community as steel rails, and that automobiles and trucks are not competitors of railroad lines but feeders of rail transportation.

## New Solid Motor Truck Tire Now Being Made by Goodyear

Akron, April 8—Development of a new solid motor truck tire with "All-weather" or non-skid tread, similar to that used on pneumatic automobile and truck tires, is announced by the Goodyear Tire & Rubber Co.

The adoption of the All-weather, diamond block design of Goodyear passenger car tire, as a tread principal for the new solid tire, will afford more positive traction for heavy and slower moving trucks, and will increase the field of usefulness of solid truck tires, it is announced.

The side walls of the new tire are built

on an angle to prevent undercutting of the tread. Tests conducted by Goodyear with the new tire, have demonstrated that it can be used on roads and under conditions which have formerly been barred to the easily mired heavy truck on solid rubber tires. The additional height afforded by the new tread, provides an oversize factor for cushioning both the truck and the load as well as taking much of the bump and jar out of the truck driver's daily job.

Goodyear has started the new All-weather tread solid tire on a large scale. The new tire is considered one of the most important developments of recent years in the evolution of the solid tire.

## Friendly Receivership to Aid Plan of Maxwell Motors

Detroit, April 8—The reorganization of the Maxwell Motor Co., Inc., entered today upon the final stage. A temporary and friendly receivership filed in the United States district court marks the last step in the proceedings. The primary purpose of the receivership, which was agreed to by all interests concerned, is to establish title to the properties under the reorganization.

The court named President W. Ledyard Mitchell as receiver. Mr. Mitchell with A. E. Barber, general sales manager, has been in active direction of Maxwell business during the process of reorganization, and members of the committee said his appointment is evidence of the continuation of the policies which have been responsible for the recent progress and development of the Maxwell and Chalmers properties. The receivership is expected to clear the way for carrying out the larger plans which already have been put into operation on a limited basis, and strengthening and expansion of the factory and dealer organizations will proceed along the lines followed recently.

### Sale Will Hasten Reorganization

The sale of the properties in accordance with the order of the court will be held shortly and this will clear the road for the discharge of the receiver and the consummation of the reorganization plan. This will render available the \$15,000,000 which has been held in readiness by an eastern banking syndicate for the refinancing of Maxwell Motors upon the completion of the negotiations for the Maxwell-Chalmers merger.

The Maxwell Motors Co., Inc., will bid in the properties at the receivers' sale under the plan of the reorganization committee. The merger is expected to be in operation by June 1.

### PAN-AMERICAN REOPENS

Decatur, Ill., April 8—The Pan-American Motor Car Co., which closed its factory last fall, has reopened with a limited force and will gradually increase the output of cars during the spring and summer months. Orders have been coming in numerous and it is believed that the volume of business for 1921 will equal that of 1920.

## Industry in Cleveland Sets Pace for Rest of Business

**Stearns at 100 Per Cent Production.  
Other Car Manufacturers Show  
Good Conditions**

CLEVELAND, April 8—The automobile industry continues to set the pace for business in this city. In the month of March the automobile industry led all others in the great spring drive toward normalcy. On April 1 the automobile plants of the city were employing 1500 more men than they were on February 28. That is a gain of 24 per cent and it far outstrips all other gains made by various industries. The survey was made by the Cleveland Chamber of Commerce in cooperation with the United States labor department.

The Stearns factory is being operated at 100 per cent production; the Winton Co., which has been idle for some time so far as production of new cars is concerned will be in capacity production of 10 cars daily on May 1; Peerless is operating at 50 per cent of capacity and the Kurtz plant, which is a newcomer in the local field, is turning out 5 cars a day and is selling all of them. The Grant Co. has been enjoying a gradual increase in business in the present year, and March was the best month of the year 1920. April orders assure production on a larger basis than in March, and this is true of the Chandler, Cleveland, Templar and other cars.

A trip to the dealers disclosed that all are optimistic and are selling cars, although they are hustling harder for business than they did a year ago.

P. R. Ward, of the Auburn Sales Co., says that the last of the local agency's quota of cars was received and delivered to purchasers. He says that not a single car remained in his store to start him on his April business. This consistent demand for motor cars surely can have but one result on the present basis of production and that is a decided shortage of cars before the lapse of many months, according to Mr. Ward.

## Ship-by-Truck Forces Oppose Pennsylvania Tax on Gasoline

Harrisburg, Pa., April 11—"Ship-by-Truck" forces are up in arms against the proposed tax on gasoline to speed up the state's revenues. Protests against the measure are pouring in and in various sections of the state advertisements are being printed in the newspapers calling on motorists to protest to their legislators. It is said that this tax would greatly increase delivery costs at a time when normal conditions are the goal of business.

The administration bill imposing a state tax of one cent a gallon on gasoline sold in the commonwealth, except for the purpose of resale, has been reported from the committee on ways and means of the House. All taxes are to be paid into the general fund of the state treasury.

## General Motors Year's Sales Show \$57,643,909 Increase

**Despite Shrinkage of Sales Corporation Was Able to Reduce Inventories Appreciably**

NEW YORK, April 8—Net sales of the General Motors Corp. for the year 1920 were \$567,320,603, which was an increase of \$57,643,909 over sales for 1919. The net income was \$93,150,308, but \$47,766,787, which is slightly more than half that amount, was deducted to cover federal taxes, to write down inventories, for depreciation of plants, and for operations conducted in assisting employees to buy their own homes. In addition to these deductions reserves previously set up were utilized to provide for all contingencies and write down the value of inventories and other accounts to a conservative level. The net profit for the year was \$45,383,521.

The report, which was submitted to the directors, says:

### Plants Constantly Being Changed

"The officers and directors of the corporation have thought it unwise to undertake the production of materials that do not relate largely to the automobile. Thus, a comparatively small portion of the total tires produced are consumed by the automobile manufacturer, the large percentage being sold directly to users of cars for replacement purposes; the greater part of the production of sheets and other forms of steel is consumed by trades other than the automotive industry; therefore, investment in these fields has not been made. By the pursuit of this policy, General Motors Corp. has become firmly entrenched in lines that relate directly to the construction of the car, truck or tractor, but has not invested in general industries of which a comparatively small part of the product is consumed in the manufacture of cars.

"The rapid development of the industry has called for equally rapid changes in the character of manufacturing plants, but by constant reinvestment and rebuilding, the General Motors Corp. has kept well in advance and its factories may now be considered in satisfactory condition. The great plant of the Cadillac Division, in Detroit, which will be fully occupied in the summer of 1921, is the last large item of reconstruction to be finished. There still remain several small and somewhat antiquated plants that have been relegated to minor manufacturing or assembly purposes, but these items are of little consequence and may be abandoned at a not distant date.

"Constant change has necessitated careful study of customers' demands and possible improvement in the character of product. In addition to the studies conducted by the individual manufacturing divisions of the corporation, there has been organized and established at Dayton the General Motors Research

Corp. with complete organization and facilities for systematic experimentation. The corporation has thereby insured the proper checking of all developments of the several divisions and has made possible independent research and study of the problems of the industry, abstract from the routine of manufacturing. While this laboratory work is in its infancy, important developments that promise to add materially to the strength of the corporation's position are already under way.

"Rapid increase in production has also necessitated the building of houses for the accommodation of factory employees, notably at Flint and Pontiac, Mich.; Janesville, Wis., and Walkerville and Oshawa, Canada. These houses are being sold to the employees, as the corporation does not intend to carry the investment longer than necessary and already 75.7 per cent have been sold.

"The construction program, inaugurated in recent years, was about completed during the year 1920 by the expenditure of approximately \$79,161,951. There remains for expenditure during the year 1921 the sum of \$10,619,521, on authorized appropriations or approved projects, which will complete the building program. No further large appropriations for construction are needed in the near future."

### CAMPBELL JOINS BRISCOE

Detroit, April 8—H. G. L. Campbell, manager of the east side branch of the Simons Sales Co., Overland distributors in Detroit, has resigned to accept the position of division manager of the east central territory for the Briscoe Motor Corp., of which C. A. Earl, formerly executive vice-president of Willys-Overland, recently was made president. Other district representatives will be announced shortly by President Earl and several changes in the distributor and dealer personnel of the Briscoe organization are expected.

Campbell before joining Simons handled the Willys-Overland distribution for Michigan territory. He is succeeded by R. L. Fralick.

## Add New Members to Federal Highway Council Committee

Washington, April 11—The election of four members to the executive committee of the Federal Highway Council has been announced by the chairman, S. M. Williams, in recognition of their interest and activities in the work of the council and indicative of the determination of the council to place the work upon the broadest lines and under the direction of men of the widest experience. The new members are W. J. L. Banham, general traffic manager, the Otis Elevator Co.; David Beecroft, president, the Society of Automotive Engineers and directing editor of the *Class Journal* Co.; Col. H. W. Alden, vice-president, Timken-Detroit Axle Co., and S. P. Leeds, president, the Atlantic City Chamber of Commerce.

## Sales at Indianapolis Show Reach Total of \$660,840.18

**What Detroit Did Will Be Told at Annual Meeting of Dealers' Association**

INDIANAPOLIS, April 8—John Orman, manager of the Indianapolis Automobile Trade Association, has compiled a report for the board of directors on sales made by dealers and distributors at the recent spring show. The report shows that \$660,840.18 was the total of sales, but conditional sales run the figure far above \$750,000. Mr. Orman would not count verbal reports of about fifteen exhibitors. Twenty-three firms reported their retail sales, numbering 219, as amounting to \$553,349.88 and wholesale orders for sixty-three jobs reported by the same dealers amounted to \$107,490.30.

"The dealers still are feeling the good effects of the show," said Mr. Orman. "We have reports from not fewer than ten firms that sales tentatively made at the show were closed in the two weeks following. Several firms that did practically no business at the show, but devoted their time to exploiting their exhibits, report big business as a result of pushing demonstration harder than sales. They tell me it is a profitable practice and may become the plan of many other dealers."

Detroit, April 8—The annual meeting of the Detroit Auto Dealers' Association will take the nature of a frolic Monday night in celebration of the success of the 1921 show, which broke all records from the standpoint of attendance as well as cars and trucks sold. The report of Manager H. H. Shuart, showing the actual number of cars sold at the show, the record attendance and a handsome balance from the financial end and the election of officers for the coming year will complete the work of the business session. President A. L. Zechendorf, who has held office for the last two years and whose administration has been highly successful has announced that he will not stand for re-election. Members of the association however are averse to permitting him to relinquish the office and a strong effort is being made to have him reconsider. In the event he refuses to consider another year's service Guy O. Simons is looked upon as the most likely candidate for successor.

### FWD TRUCKS REDUCED \$700

Clintonville, Wis., April 11—The board of directors of the Four Wheel Drive Auto Co. has passed a resolution taking effect April 4 reducing the price of FWD trucks from \$4900 to \$4200, a reduction of \$700.

### SALES COMPANY ORGANIZED

The Sittason Motor Co. has been organized at New Albany, Ind., with a capitalization of \$100,000 to handle a retail sales only. Claude A. Sittason, Morris D. Sittason and R. H. Boyce are back of the company.



## Concerning Men You Know

J. C. Kearns has been appointed acting sales manager of the Republic Rubber Corp., Youngstown, following the resignation of H. J. Woodard as vice president of the corporation in charge of sales. L. M. Barton has been named manager of pneumatic tire sales.

E. N. Reifel, former manager of the San Antonio, Texas, branch of the Fisk Tire & Rubber Co., has been made manager of the Houston branch to succeed R. L. O'Brien.

Ernest V. Derks, previously service manager of the New York Buick Motor Co., and later purchasing agent for the branch, has become proprietor of the New Rochelle Buick Co., New Rochelle, N. Y. Temporary quarters are being maintained at this address until the new company can secure a new building for sales and service.

Ralph M. Ralston and Lindsay Goss, owners of the Presto-O-Lite battery service in Kalamazoo, Mich., have bought out the Exide battery shop, operated for years by Alfred M. Snook. The two businesses will be consolidated.

Harry C. Sheridan, referee in bankruptcy, has given creditors of the Bull-Madison Tractor Co. of Anderson, Ind., and Minneapolis, Minn., until April 7 to file their amended petitions for their share of distribution of the assets. Demurrers to these claims will be heard by the referee the following week.

R. R. Ross, formerly New England distributor for the Columbia for several years, has embarked in the handling of automobile specialties with S. E. Baker, of the Folk-Baker Co., a partner in the Saxon agency for New England.

H. F. Wardwell, president of the Briscoe Motor Corp., Jackson, Mich., announces the appointment of C. A. Woodruff as purchasing agent. Mr. Woodruff was previously director and purchasing agent of the Chalmers Motor Corp. and later, general manager of the Saxon Motor Car Co.

H. W. Casselman, president of the West Side Oakland Sales Co., Chicago, has resigned to enter the banking business and has been succeeded by H. L. Moritz.

H. N. Brandon, associated with the Bearings Service Co., Detroit, in various branches, has been appointed manager of the St. Louis branch of the company. He is succeeded as manager of the Milwaukee branch by E. L. Farnsworth who has served with that branch as traveling representative. M. D. Wallace, formerly connected with both the New York and Baltimore branches, has been named as manager of the latter branch.

E. H. Roddy has joined the Barco Battery Co., Inc., manufacturer of the Bearcat Storage Battery as general superintendent. Roddy formerly was with the Electric Storage Battery Co. and also the Philadelphia Storage Battery Co.

Carl H. Becker has been appointed assistant sales manager of the Saxon Motor Car Corp. and Charles P. Ackerson, supervisor of dealers.

John A. Miller has been appointed sales extension manager for the Hatch Motors Co., distributor of Marmon and Hupmobile cars in eastern Pennsylvania, southern New Jersey, Maryland and Delaware.

C. S. Heimbauch, for more than twenty years salesman and sales manager in the implement and tractor business, has been placed in charge of the Des Moines branch of the J. I. Case Plow Works Co.

Lucius Tyler, who sold Maxwells in Boston 10 years ago, and is now in the rubber business heads a new organization which will have the New England distribution of the Kelsey car.

E. A. Kelly, for the last thirteen years associated with the Splittorf Electrical Co., has returned to Chicago as manager of the local branch, which has jurisdiction over western territory. Since leaving the Chicago branch six years ago he has been at the factory and has represented the firm in Europe.

R. H. Rittenhouse, salesman with the Maxwell Sales Co., Chicago, has embarked in business as a dealer handling the Maxwell and Chalmers cars on the north side of the city.

L. E. DeGroat, formerly of the sales staff of the Timken Detroit Axle Co., is with the Acme Motor Truck Co. of Cadillac, Mich., in charge of dealer promotion work.

W. L. Shaffner, for the past nine years connected with the B. F. Goodrich Rubber Co. in various work throughout the country, and for the past five years in the manufacturers' division of the Detroit district, has resigned to become associated with the Acme Motor Truck Co., Cadillac, Mich. He will be in charge of the National Account Division for Acme, under the direction of Mr. C. J. Helm, sales manager.

Eugene Wolfshiemer, of New York, has taken over the management of the Delta Tire & Rubber Co., New Orleans.

Ralph Leavenworth, advertising manager of the Standard Parts Co., Cleveland, has resigned to become director of personnel with S. L. Weedon & Co., Cleveland.

Paul Fitzpatrick, who has been vice president of the General Motors Acceptance Corp., has resigned to become vice president of the General Motors Export Corp. Fitzpatrick left the Continental Guaranty Co. to go with General Motors and played a prominent part in the organization of the Acceptance Corporation.

R. G. Hendricks, who was connected with the King Motor Car Co. under the old regime as factory manager, and who was retained by Charles Finnegan when he purchased the King assets, has resigned.

erson Rubber Co., which is operating in leased quarters pending the completion of the first unit of its plant. By April 15 or May 1 production will be on a regular quantity basis. Orders now on the books will require the maximum capacity of the existing facilities until past July 1, and new business continues to be received in satisfactory volume.

### Auction Closes Car Business; to Concentrate on Truck Sales

Seattle, April 8—Frank Waterhouse & Co., one of the pioneer firms along automobile row, has closed out its automobile business by selling at public auction its lines of new Marmon and Kissel cars and a stock of about 100 second-hand cars. This is the first time that an automobile auction sale has ever been held in the northwest.

The company hereafter will devote its entire resources and manufacturing facilities to the manufacture and sale of Vulcan trucks in three different sizes. At the present time it is marketing the 2½-ton Vulcan truck, built at the big Vulcan plant in Seattle. The company will shortly bring out a 1½-ton and also the larger 3½-ton truck.

### Hartford Takes Steps to Form Service Association

Hartford, Conn., April 7—Sixty dealers, garage owners, service managers and other executives dined at the City Club tonight and then discussed the advisability of forming a service association similar to the ones already in existence in fourteen other cities. Addresses were made by Herbert L. Bailey, vice-president of the Automotive Service Association of Brooklyn, Howard Gates, treasurer of the Automobile Service Association of western Massachusetts and J. Howard Pile, mechanical editor of Motor World.

These three men have been instrumental in forming service associations, and acting on the information brought together, a tentative constitution and by-laws was adopted and temporary officers

### DEALERS WANT AVIATION FIELD

Jacksonville, Ill., April 8—The Jacksonville, Ill., Automotive Dealers' Association has endorsed a proposed aviation landing field project for that city will assist in the formation of an aviation club. A committee has been appointed to cooperate with the association of business men. Later, it is planned to establish an agency for airplanes in Jacksonville and introduce commercial machines.

### DURANT CAPITAL 100 MILLION

Dover, Del., April 8—Durant Motors, Inc., has filed articles of incorporation, giving its capital stock \$100,000,000. This is regarded as confirmation of the rumor, current about a month ago, that W. C. Durant, who withdrew from the General Motor Co. when members of the DuPont Co. obtained a controlling majority of the stock, intends to regain supremacy in the motor world.

### Utah Follows Suggestions Conference Committee Made

Salt Lake City, April 9—The Utah legislature at its recent session passed motor vehicle legislation which closely followed nearly all of the proposed vehicle laws sponsored by the Uniform Motor Vehicle Conference Committee.

This legislation was sponsored locally by the Utah Motor Vehicle Conference Committee consisting of the following members: N. J. Hansen and R. M. Cross, representing the Utah State Automobile Association; Frank Botterill and A. S. Brown, representatives of the Intermountain Automobile Trades Association; Russel Richards of the Hyland Motor Co., representing the N. A. C. C.; C. C. Backes, secretary of the Intermountain Automotive Trades Association, representing the N. A. D. A., and W. D. Rishel appearing for the American Automobile Association.

### FLOOD TRACTOR TO CHANGE NAME

Spokane, April 8—Plans of the Flood Tractor Co., manufacturing a patented four-drive farm tractor here, provide for

production of the first standard tractors to be placed on the market immediately following May 1, and the reorganization of the company into a million dollar corporation and the changing of the name to the International Automotive Corp., according to I. B. Ricketts, secretary-treasurer.

### BERLIN HEADS VICTOR TIRE

Springfield, Ohio, April 11—H. S. Berlin, formerly connected with the Firestone Tire & Rubber Co. in an executive capacity, has been elected president and general manager of the Victor Rubber Co., manufacturer of automobile tires. He will be assisted in the management of the company by H. H. Durr, secretary and treasurer; Frank R. Talbott, factory manager; C. A. Swinehart, sales manager; J. J. Anzalone, comptroller and P. C. Leffel, purchasing agent.

### DELIVERING JEFFERSON TIRES

Jefferson, Wis., April 7—Initial deliveries of Jefferson tires in both cords and fabrics have been made by the Jef-

# A Department of BETTER BUSINESS



A dollar will be paid for all ideas accepted as Better Business—Perhaps you have some.

Conducted by Ray W. Sherman

## Give the Baseball Nine a Ride

Baseball is occupying a big amount of thought in every sports loving man at the present time and as men of this sort are the live wire men who like cars and want cars of their own, why shouldn't it be a good thing for a dealer to hook up with baseball in some sort of an interesting stunt? For instance, on the occasion of the first big game at the home "lot" the dealer might have a procession of ball players for which he could furnish all the cars. He could easily secure the aid of some of the folks to whom he had sold cars and pull off a parade in which the ball players and prominent fans would be given free rides in the kind of cars sold by the dealer. Each car might carry a banner advertising this unique feature of the parade and the dealer might then use some advertising telling the sports loving men of the city that the best car for them is the car chosen by the ball players for their parade. Such a stunt would get a lot of publicity for the dealer in quarters where it would do the most good.

## Why Not Tell Them About It?

A news stand in Des Moines is displaying a neat sign that reads: "The 1921 trail maps and guides are now here." It gives one the feeling of spring and thoughts of an automobile trip soon begin to grow into actual plans. Many automobile dealers have the same maps in stock and lots of other touring equipment, so why not use a similar sign to tell the customers about it?

## Try Riding Street Cars to Get Prospects

Of course a big acquaintance is a tremendous asset for any automobile salesman. But how many salesmen make the most possible out of their acquaintanceship? Most salesmen, for instance, scorn the street cars and yet if a salesman would spend some time every day riding on the cars which tap that part of the city in which he has the widest acquaintanceship he would be sure to see a number of people riding on the street cars who should own automobiles. And in this way would get prospects and have a chance to talk to them on the car and have a real talking point—that of urg-

ing them to purchase motor cars in which to ride to and from work. It is a mistake for an automobile salesman to always go gunning for prospects in an automobile. Try street cars now and then.

## They Furnish Parking Space

The Paine Motor Co., Paige distributors in Des Moines, have rented a vacant lot next to their place of business and enclosed it with high wire netting. A sign which reads "Free parking for Paige owners" invites owners to leave their cars there while down town. Such service is not very expensive, but it very handy and it brings the cars around at frequent intervals.

## Weather Report an Aid to Accessory Sales

The Rude Auto Co. of Marshalltown, Ia., have found it profitable to post a daily weather report on a small blackboard that the driver must see as he drives out of their shop. Not only the weather report is posted, but a few words of advice are also added. Some of the reports read as follows: COLDER TONIGHT—COVER YOUR RADIATOR, RAIN TOMORROW—HAVE YOU TIRE CHAINS? HOT WAVE—WATCH YOUR MOTOMETER. The report is not only a convenience to the motorist, but calls his attention to accessories that he needs.

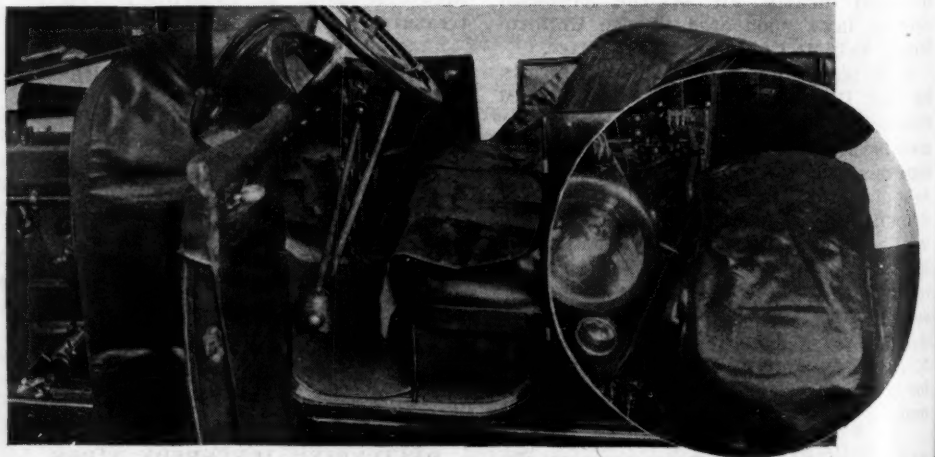
## He Sells Them a Set of Tools

Many dealers sell a tool now and then to a user who does much of his own work, but most of this business goes to the hardware stores in many cities. One dealer who carried a good supply of automobile tools fixed them up in sets suitable for each of the common makes of cars. For instance, his valve grinding set for a Ford consisted of grinding compound, a valve grinder, a valve lifter and a sheet of instructions. The service he gave in picking out tools fitted to the needs of a user of any make of car and instructions enabled him to get much of this class of business in his territory. Many owners think a dealer resents their working on their car, so do not like to come to a garage for advice or tools, but this plan removes this feeling. By fixing up the sets in spare time a much larger sale is made in many cases than if a salesman had to hunt around for what the user should have to do a job properly and much time is saved in making the sale.

## Sold 213 Used Cars Last Year Through Want Ads

L. J. Bobilya, of Fort Wayne, Ind., is a dealer in used Fords exclusively. He conducts his business from a small garage at the rear of his home in the residence section of the city. Last year he

## Car Owners Appreciate This



It doesn't take long for the glad news to spread among owners that so-and-so service station takes extra little precautions to protect their customers' cars. The covers shown above keep the seats clean and safeguard the paint on the fenders from scratches



J. H. HANSEN CADILLAC COMPANY  
Omaha-Lincoln  
Nebraska

Mr. B. M. Ikert,  
Editor, Motor Age,  
Chicago, Ill.

Dear Sir:

As per your request, I am mailing you under separate cover a photograph of our salesroom.

I was certainly much pleased that you called on me, and particularly pleased at your expressions of approval on our office and service department arrangements.

We are quite pleased ourselves, that we have been able to go through the so-called "storm" in fairly good shape without having found it necessary to reduce the wages of our employees or the size of our sales force. As a matter of fact, our service business is more lively than ever before, and we have a larger sales force. We are also spending more for advertising. The reason for this is that we believe money judiciously spent now will put us before the people and the real rush of spring business will come to us earlier as a result of our efforts.

While the sale of cars, of course, is not up to normal, we are doing enough business to encourage us to the point of incurring additional expenses to stimulate future business.

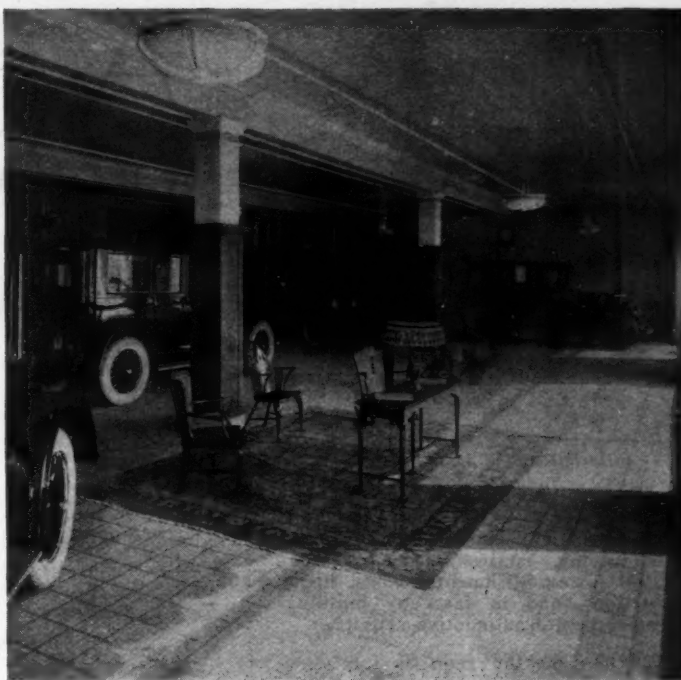
Our entire organization consisting now of sixty-four employees, believes in being alert and on the go rather than sitting idly waiting for times to improve. We continue to hold unusual displays and salons on our salesroom floor, daily meetings of the sales organization and weekly meetings of the entire organization. We rebuild, retop, retire and repaint all our used cars, and constantly keep our entire stock in saleable condition.

With our service station up to the minute in efficiency, and with a vigil eye constantly on the trading question, making only trades that are legitimate and money-makers for us, we fear nothing for the present and have quite a bright outlook to the future.

Again thanking you for calling on me, I remain

Very sincerely,

J. H. HANSEN,  
President.



In traveling about the country to ascertain business conditions at present and prospects for the future, the editors of MOTOR AGE find no magic in the success of prosperous dealers—nothing but plain hard work. The letter at the left is typical of the reason why some dealers have weathered the recent business depression with colors flying

sold 213 cars, this being his second year in business. When asked how he finds prospects, Mr. Bobilya stated that the majority of this prospects come to him through advertisements which he inserts in the want ad columns of the daily newspapers. He does no display advertising and practically no promotion work outside of these want ads.

### School Teacher Prospects as Vacation Begins

Now that the pay of school teachers in most sections of the country has been raised to a very good figure and now that most of these teachers have enjoyed the benefits of this increased pay for over a year, it would seem as though teachers, as a class, ought to be splendid prospects for the purchase of cars. They would have real use for cars in going to and from school and they have vacations all summer time—the best automobile time of the year. And, as a class, they own comparatively few cars. Get after the teachers in YOUR city now before their summer vacations begin.

### Cartoons Prove Efficient Salesmen

An Iowa concern stocked up heavily on special radiator caps, but did not get a suitable turnover until they employed cartoons as salesmen. The first pictures showed a man having the various troubles with a stick, hot, frozen radiator; but the last view showed him with a new cap and expressed the "grand and glorious" feeling he experienced. The drawing was made by a local high school student and the message was printed on postcards. The results were quickly noticeable and the selling cost was very low.

### He Sells Them Another Tractor

Many Iowa farmers have a large tractor which is serving well on certain kinds of work, but they still use horses to do cultivating. Some of them don't even think it possible to do a good job of cultivating with any type of tractor. One dealer got an agency for a motor cultivator and sent a special salesman out to sell it. He drove into the field and helped the farmer plow and let the farmer try it himself. As some of the farmers were in need of help he often hired out to cultivate by the acre. In this way he soon established the cultivator and found the owners of large tractors the best prospects.

### Locate Shop Work to Draw Attention

By locating the work in your shop so that it will provoke interesting comment and spectacular jobs where they can be noticed by the curious public many dollars of free advertising can be secured. A welder, if clean in appearance and workmanlike, makes a spectacle which never fails to draw attention, particularly if working at night when the powerful light adds to the attraction. A machinist doing work on any clean machine shop tool, lathe, miller, shaper, etc., attracts attention.

The use of special tools can be made a drawing card with favorable comment. If you use even so common a tool as an electric or air valve grinder, by all means locate this job where it will be noticed in preference to an ordinary job of screwing up and unscrewing. The man who gives these things even a passing glance is interested for he drives and looks for the place where he can

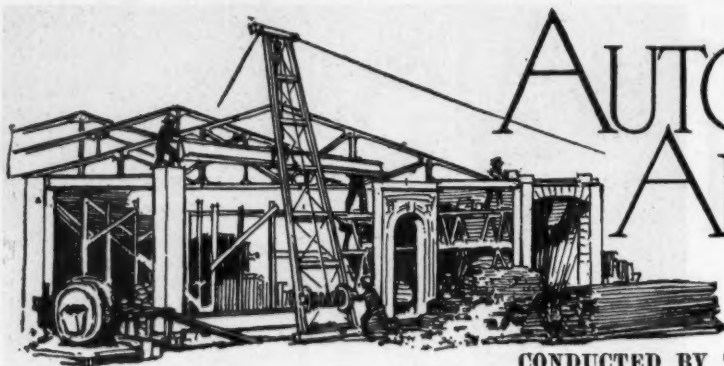
get best service. He knows the advantages of speedy special tool service and the well equipped shop. Show him you have this necessary equipment. Even the matter of adjusting the carburetor on a powerful "snorty" motor is better than nothing—provided you are sure carburetor adjustment is what is needed. The world likes success; show them you have it.—E. H. Birdsall, Madrid, Ia.

### He Sells Used Oil and Makes a Profit

The oil that is drained from the crankcase is usually wasted in the average country garage, but one Iowa dealer says he sold more than \$100 worth of used oil last year. He has two barrels just back of his shop, one for crankcase drainings and one for kerosene in which parts have been washed. By means of pipes through the wall the workmen are able to dispose of the oil quickly, yet the fire hazard is practically eliminated. When a barrel is full it is filtered and sold for hog oilers, for greasing plows, for some sorts of machinery and for starting fires.

### Demonstrates the Economy of His Cars

Several devices have been put on the market recently that show the number of miles per gallon of fuel the car is making. A dealer got one of these devices for his demonstrator and demonstrates the economy of his car as well as its riding qualities and performance. The stunt was of considerable assistance in selling, and he thinks at least two sales can be traced to the instrument. Not only has it helped him sell cars, but he has sold several of the devices.



# AUTOMOTIVE ARCHITECTURE

Planning and Building Problems

CONDUCTED BY TOM WILDER



## Automotive Architecture

**I**N this department MOTOR AGE aims to assist its readers in their problems of planning, building and equipping, service stations, garages, dealers' establishments, shops, filling stations, and in fact any buildings necessary to automotive activity.

When making requests for assistance please see that we have all the data necessary to an intelligent handling of the job. Among other things we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated, and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

## Garage Between Two Flat Buildings

NO. 327

Can you give us any advice on building a garage—52 by 150 ft.? This property is the second location from the corner. A flat building is on the corner lot, which runs back 100 ft. Our garage will extend from the street to the alley, and we have the privilege of building an "L," which will extend back of the flat building.

It is our plan to build a one-story building, using trusses, and we would like to arrange it so that we could build the front end high enough to accommodate offices over the showrooms. Our sketch shows two display rooms, and a driveway through the center. We plan to rent one side at least a year or two, and when we build the "L," we will use the entire front for showroom, having an entrance from the alley and one on Brown street.

We plan to put a 62 ft. shop on the west side, and will use side windows in the shop only. The light of the shop would have to come from skylights, as there is a 60 ft. flat on the west side of the building. Our frontage will be between two flat buildings.—Mohl Motor Truck Co., Davenport, Iowa.

We could lay out this building as you suggest, but believe you are making a mistake. First the aisle and entrance in

the center will make the two rooms too narrow for truck showrooms. Second, if you have your shop along one side and make it wide enough for cars and trucks to enter this will not leave room along the other side for cars and especially trucks to maneuver into positions along the other side. The aisle will also be too narrow.

It would also be very expensive to rebuild your front later on; the alterations which are always more costly than new work, would undoubtedly cost more than the profit from the rental of the store would net you and you would have the inconvenience for nothing.

If you can make your garage entrance at the back of the flat building at once, even though there is only a gravel road through the yard, you could plan the rest of the building in a permanent fashion.

Long narrow divisions are not as good as broader more square sections where the movement of cars is not hampered. Some such arrangement as we show will give a much more usable building.

## Service Station for Electrical Equipment

NO. 328

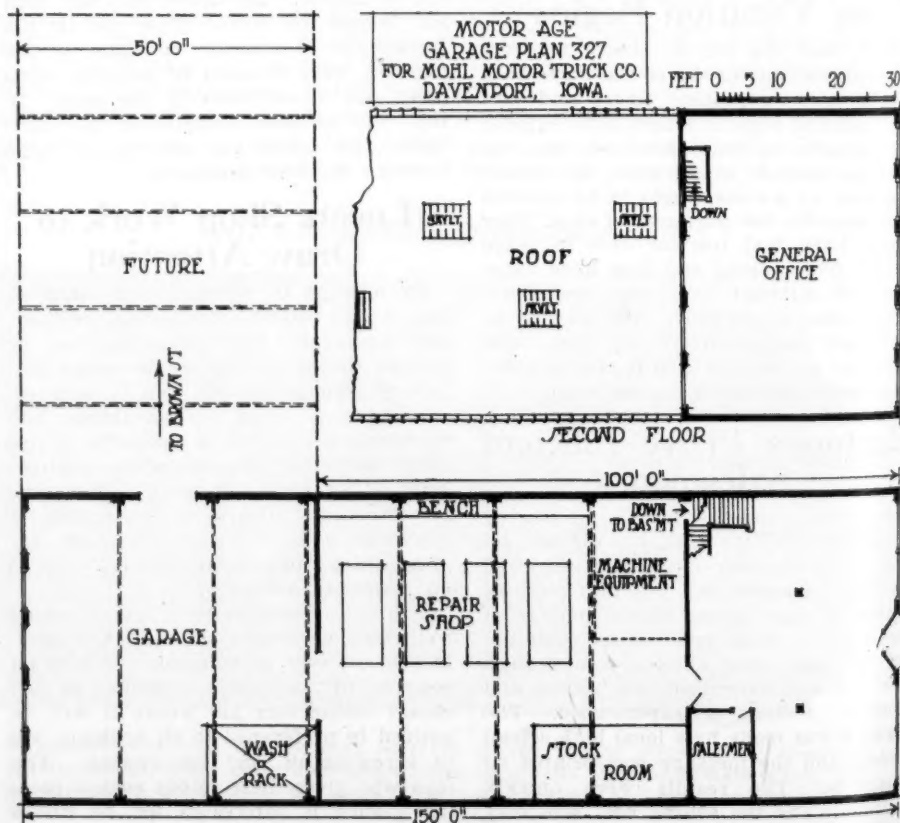
**Q.**—We are contemplating putting up a building suitable for battery and automotive electrical work on a lot 50 by 144 ft.

We do not intend to sell cars, but may take on the sale of electric cars a little later. It is our idea to have an entrance from the front and an exit in the rear, but would like to have your suggestion on the advisability of having an exit in the front, or in other words, two doors in the front, one for the entrance and one for the exit.

There is at present a two story brick building across the back end of the lot, 50 ft. long and 30 ft. wide, which we figure on using as a battery shop on the ground floor with electric repairs on the second floor, leaving the balance for garage space, suitable for a wash rack and some storage.

At the present time we employ four men in the electric repairshop and two men in the battery shop, but will increase this in the new quarters.

Regarding accessories, we want a showroom for this adjacent to the office sufficient to handle a complete line of electric accessories with an additional small





line of the most important regular accessories.

We should also like to secure a book or portfolio showing the different types of fronts for buildings of this type if you have any, or if not, advise us where we can purchase such a book.—Indiana Electric Service Co.

With a building of this size more than one entrance is entirely unnecessary and wasteful. There are hundreds of storage garages in Chicago that are 50 ft. wide and from 150 to 200 ft. long that have only one entrance in front. These storage garages have much more traffic than you would have and considering the arrangement of the building at the rear of your lot we believe you would do more harm than good by cutting a passage through it.

## Battery Service Station on Narrow Lot

NO. 329

Please give suggestions for constructing a service station on a lot 30 by 125 ft.—A Reader.

The greatest disadvantage of a narrow lot such as you describe is the high percentage of total space used in a passage, in this case amounting to more than 35 per cent. We have tried to arrange the building so that the entire front could be used for store and display purposes, but find that with an entrance on the side near the front the general scheme would not be so good and there would be even more waste in aisle space.

The best use we can make of the side alley especially since it is not paved, is as a source of light for the shop. With plenty of windows along that side, it will serve nicely for this purpose.

A skylight near the testing stand and one over the aisle farther back will turn darkness into daylight along this long tunnel.



## Atlanta's New \$250,000 Sales and Service Station

This new building of Black & Maffett at Atlanta, Ga., recently erected at a cost of \$250,000 is said to be one of the finest buildings in the whole south. Whether that is true or not, it has some features which are worth pointing out. Note that the floor level is even with the sidewalk at the entrance and that at the far end of the showroom the floor is below the sidewalk, while at the corner it is quite high, probably 2 ft. Also note that the glass extends almost to the floor, the sill being just high enough to prevent people from trying to walk through the glass. This building being on a hillside, advantage is taken of the situation by making entrances to all floors on the side street. The first large door enters the first floor by a short ramp, the middle one enters the lower floor and one at the extreme end enters the basement.

## COULDN'T HOLD SHOW? DENVER DOES

Continued from page 17

ning a heavy vote for uniqueness. This hood is a strictly Denver product, having been designed by the Linger-Goff & Hough Motors, Inc., Gardner distributor. The motor is enameled white, and tube lights carrying a total of 350 watts are cleverly placed beneath the "showcase" hood.

In addition to an intensive advertising

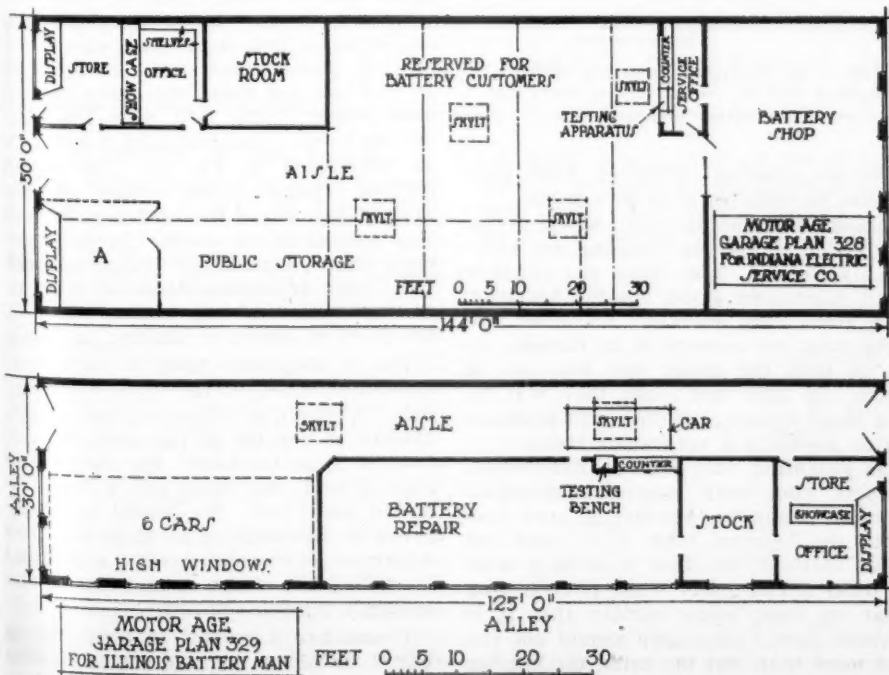
and publicity campaign begun two weeks before the show, the chief promotional work done in advance was a lining up of distributors to urge all the dealers throughout their territory to come in for at least a part of the event. All these outside dealers were furnished passes, and in many cases distributors offered to pay railroad transportation for dealers living beyond mountain passes not open to motor travel this early in the spring. Sales congresses are being held by several of these organizations. A considerable drive-away of cars by nearby dealers is expected as a result of the show.

Attractive rest-rooms, particularly for women and children, have been provided out of four groups of the Auditorium's theater boxes by the Denver Jobbers of Automotive Supplies, Denver Garage & Repairmen's Association, Denver Ford Dealers and the Colorado Manufacturers' & Merchants' Association.

For size of show, in relation to the distributing territory, it is interesting to note that this territory has an area of nearly 340,000 square miles, or more than three times the combined area of the States of New York and Illinois, while the total population of this territory is only about one-third that of Chicago or one-sixth that of New York City. And this section is still in practically a pioneer stage in respect to agricultural and industrial development, with vast possibilities.

The motorizing possibilities of such a territory are tantalizing to the imagination, and the 1921 Denver automobile show is counted upon to produce a powerful influence in the direction of more and better automotive development throughout this hard-working and beauty-loving region.

## Two Plans for Battery and Electrical Equipment Repairshop



# The Readers' Clearing House

## Questions and Answers.

CONDUCTED BY ROY E. BERG

Technical Editor, Motor Age

### Adjusting Gears Accurately

**Q**—How is the engine and transmission of a motor car lined up with each other in assembling at the factory? What should be done in case they get out of line by the frame getting out of shape or otherwise?

2—How can the pinion and drive gear in the differential be made to mesh exactly as you want them?

3—Would like directions that will apply to any car. For instance in the first question putting a different engine in an old car. Also give answer to apply particularly to a Chevrolet 490, 1919 model.—Carey Scott, Watertown, S. D.

1—We shall take a case where the engine has three point suspension and a standard clutch and gear set is used. If the units are assembled regardless of whether the frame lines up perfectly or not they will be in alignment, or in other words, the unit power plant assembly is not effected in any way by frame alignment. In the case where the units are separate, universal joints are always provided which will take up for slight misalignment.

In order that the spiral bevel ring gear and pinion may operate correctly, the rear axle must be in perfect alignment. That is, the differential axis must be in the same plane as the pinion axis. If there is any variation at all, the pinion axis must not be above the gear axis, as that would throw the contact or load on the heel of the tooth.

It is very important that a careful inspection of the bearings be made before they are put back in their respective positions. If single row ball bearings are used, they may have a little angular movement, but must not have any radial play. By angular movement, we mean a slight rock; an action which we get in a ball joint. By radial movement we mean straight movement up and down. If the bearings are laid on a surface plate and you can move the cone straight over against the outer race and notice much play that way, the bearings should not be used. Also, make sure that the balls are not damaged. If they spin freely, no doubt they are all right. If the bearing sticks, clean it carefully with gasoline to make sure that all foreign matter is removed. Also, try and keep them in a clean place.

If the bearings are of the roller type, examine the rolls and make sure they are not pitted or worn too bad. Also inspect the linings or cups which fit into the differential or pinion housing. If



FIG. 1

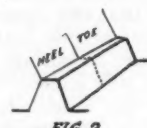


FIG. 2



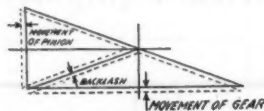
FIG. 4



FIG. 6



FIG. 8



Figs. 1 to 9—An explanation of these figures will be found in the story on these pages

these are pitted or excessively worn, they should be replaced with new parts.

Make sure that all parts which go on the inside of the gear housing are thoroughly cleaned. Any chips, grit or other hard substances grind out the bearings, and gears very quickly. All studs and nuts must be a good fit in threads, so as to hold the gears and bearings in place. If these are loose, they will let the gears vibrate, and they will probably go to pieces in a very short time.

In mounting ring gear on differential, inspect ring gear seat of differential case to determine whether it runs true with the bearing hubs. If it runs out more than .002 in., face it off in a lathe to make it run true. When riveting ring gear on case, make certain that it is riveted tight. Ring gear should not run out more than .008 in., using the bearing hubs of the differentials as centers.

When driving pinion on shaft, see to it that it does not ride the key, also that it is driven on tight. Pinion must not run out more than .004 in. on shaft.

The most common method of setting up spiral bevel gears, is to set ring gear and pinion so they come flush, either at the large or small end of the teeth, and have an operating clearance of from .005 in. to .008 in. For perfect adjustment, however, this method must be forgotten. An experienced mechanic can very often locate the proper running position by his sense of touch, but even that is not always dependable. This method is not correct at all times. It depends largely on the cut of the gear and the variation that takes place in its manufacture.

When the mechanic is ready to place the gears back into the axle, the best way to do is to roll the pinion around the ring gear by hand and note the position which the pinion takes at the large or small end, whether it sticks out or runs in. Assemble them in the axle as near as you can, in that position, allowing from .005 in. to .008 in. back lash between them. Place the axle under the car, and at the same time paint the gear teeth with a thin coat of white lead. After this is done, jack up the rear wheels and start the engine, throwing transmission into high gear, also throw in your brake, which must be equalized so you can get about the same load on each wheel. This will wipe the paint off the teeth. You may find a condition as illustrated in Fig. 9. The shaded portion represents the contact of your gear. That means the load is pulling on this portion of the teeth. In that case, move your pinion in, or toward the rear, two, three or more notches of your adjusting nut, until the pinion wipes off the paint as shown in shading on Fig. 4.

Fig. 4 illustrates what is termed as desirable contact on the spiral tooth ring gear. Contact as shown is just a trifle heavier on the toe of the tooth (Fig. 2) than it is on the heel. The heel of the gear tooth is the large end, and the toe is the small end. We intend to set the gears in this way, so as to be sure that we get an even contact when a full load is applied; the pinion in that case always having a tendency to lift.

If one has a contact as illustrated in Fig. 8, or where the load comes on what is termed the flank of the gear tooth, it



means that the pinion is too far in toward the axle. Gears set up in this way are noisy. To correct, pull pinion out until contact comes to the full working depth of gear tooth, without leaving lowest point of contact (See Fig. 4). If the contact is as shown in Figs. 8 and 9, it should only be changed by moving the pinion. If the load is centered in this place, you always find that you will have a noisy axle. Noise almost always can be eliminated by the pinion adjustment.

If the contact on tooth appears as shown by shading in Fig. 6, it means that there is too much back lash between ring gear and pinion. Gears set up this way will eventually break off at the heel. To correct, move ring gear toward pinion, but make sure there is back lash, as gears cannot run tight. If the contact still shows heavy on the heel, the large end of the gear, (See Fig. 2) change the gears. If you still have that contact, the axle is machined wrong or sprung.

Contact as shown in Fig. No. 7; that is, heavy on the small end, or the toe of the tooth, is not bad, although it doesn't want to be centered there too much. Gears set up this way will eventually break off at the toe. To correct, move ring gear away from pinion.

Under no circumstances should the gear pass with a heavy contact on the heel.

The lower figure illustrates two cones, which spiral bevel gears really are. It illustrates the difference you get in back lash, by moving either the ring gear or the pinion the same amount. For example, on a 4:1 gear ratio, it would be necessary to move the pinion four times as much as the ring gear, in order to get the same amount of back lash. So when it is necessary to increase or decrease back lash very much, it is best to try to move the ring gear. However, you can tell from your contact just which of the two gears to move.

## ELECTRICAL SYSTEMS

### STARTING MOTOR FAILS

Q—I know of three 1914 Jeffery cars using the U. S. L. starting and lighting system, and the starter will not operate more than a few weeks after repairing. I put in a new battery and switch from another car in one of the cars, starter worked fine for a time, but soon failed. The ammeter always shows charge and lights are always bright. Give reason and remedy.

2—If an ordinary voltmeter were installed in circuit of each wire going to motor generator one wire at a time with other wires in place, what should voltage be when starter button is pressed?

3—Is there a way to wire direct from batteries to terminals or motor generator to test if switch is at fault?—John L. Nelson, Symerton, Ill.

1—The failure of the starter under the conditions mentioned must be due either to battery, starter switch or starting circuit trouble. The fact that a different battery cures the trouble proves the starter to be in good condition. The most likely cause would be a partially

### The Readers' Clearing House

*THIS department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.*

*In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.*

When the gears are adjusted in this manner under the car, and you feel sure that you have them set up as good as you can make them, you may run the car out on the road and give it a one mile test without putting oil in the axle housing. This will tell what can be expected, as far as noise is concerned. Oil will not deaden the noise very much; it only acts as a lubricant.

If you find it advisable to make further adjustments to make axle quieter, before filling up case with oil and turning car over to the customer, paint the gears up again and make certain that you have contact as illustrated in Fig. 4. Full tooth contact is necessary to carry the load.

While this method may seem complicated at first with a little practice a good mechanic can set up gears in the above manner almost as easy as by guess work, and it certainly will give much more satisfaction to the owner of the car.

tery when starter switch is closed. If there is over a 10 per cent variation, check up contacts in the starter switch and all terminals and connections in starter circuit. An increase in the charging rate would undoubtedly help.

2—Connect the voltmeter as shown in Fig. X on page 53 and when switch is closed voltage should drop below 21. As a general rule, the voltage of each individual cell should not drop below 1.75 volts when starter switch is closed.

3—By making connections as shown by the dotted lines the starter switch can be shorted out of the circuit and starter be operated. Heavy cable must be used to make a proper circuit.

### REVERSED CONNECTIONS

Q—On a 1918 or 1919 model Dort the positive terminal of the battery is grounded and the charge from the generator enters on the negative side. If connections are reversed the ammeter reads backwards. Would it be all right to turn the battery around?

2—How is the generator output increased on Dyneto six-volt generators?—R. Lewis Alimwell, Ala.

1—The explanation of what connections have been made are so indefinite that we cannot state whether it would do any good to turn the battery around or not. We advise checking the wiring carefully to see that the connections are the same as shown in Fig. 10 and to see that the wires are in good condition. The battery can be turned around if you wish but that will not insure correct ammeter readings.

2—Some of the Dyneto generators are provided with third brush control and others with an automatic cutout and regulator.

### MAGNETO MAGNETS

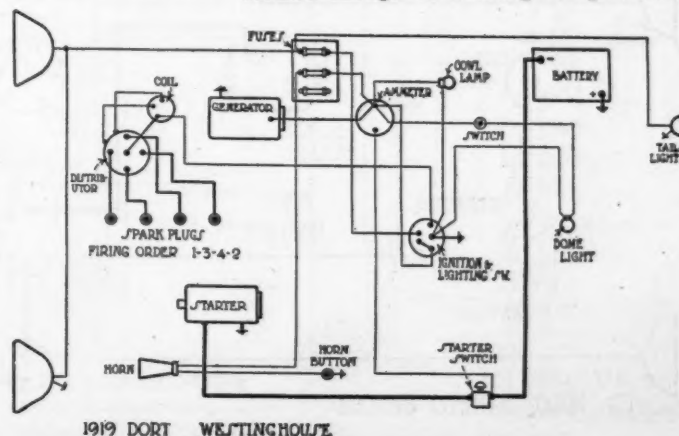
Q—We have constructed a remagnetizer following instructions given in Motor Age. We are able to improve a magnet considerably but cannot get it back to its original strength. Have used from 6 to 32 volts but fail to get any results. The magnets used in this experiment are from a Webster magneto. Should the magnets be charged separately or together?

2—How much should a magnet of this size lift, when fully charged?—J. C. Wermerskirchen, Le Mars, Iowa.

1—The magnets can be charged separately or together the only difference being the amount of time required to get them to full strength. If the proper material has been used and the magnets have been properly wound as directed we see no reason why they should not receive enough of a charge to put them

run down battery due to a low charging rate, or perhaps to the driving conditions under which the car is used. Test the voltage across each half of the bat-

Fig. 10 — Wiring diagram of the 1919 Dort using the Westinghouse system



in good condition. It is possible that the steel of the magnet has changed enough to prevent its getting back to its original strength.

2—The ordinary magnet ought to hold

a weight of about 15 lb. in order to be fit for service.

#### DEACO GENERATOR

Q—Publish diagram of the internal wiring of the Deaco type 0X6 volt generator,

made by the Detroit Electric Appliance Co., Detroit, serial 4585.

2—I have a high tension magneto (Elsemann) on my M 35 Oakland I.C. I do not seem to be able to get the right firing order or cannot get the wiring right from spark plugs to terminals on magnet. Publish diagram.—Ada Louise Martin, Minot, N. D.

1—Diagram of the internal wiring of the Deaco type 0X6 volt generator is shown in Fig. 16.

2—Diagram is shown in Fig. 15.

#### 1917 DODGE WIRING

Q—Publish wiring diagram of 1917 Dodge.—C. J. H., Arkansaw, Wis.  
See Fig. 12.

#### REGAL WIRING DIAGRAM

Q—Publish wiring diagram for Regal Light 4, 1916, model 552-E with Dyneto generator and starter.—Howard Mercer, Aurora, Ill.

This is shown in Fig. 13.

#### HUP 32 WIRING

Q—Publish wiring diagram of Hupmobile 32.—A. C. Bothwell, Toledo, Ohio.

This is shown in Fig. 14.

#### HUDSON WIRING

Q—Publish diagram of starting and ignition system of Model 37 Hudson.

2—What is the horsepower of this engine?—C. P. Nicholas, Dundalk, Md.

1—This is shown in Fig. 11.

2—We are unable to furnish the horsepower of this engine.

#### DUAL SYSTEM

Q—Is it possible to connect to storage battery, a Westinghouse lighting system with generator and a Bosch magneto, DR4, dual system? If so, publish drawing.—W. S. Beers, New Rochelle, N. Y.

From the brief amount of information given we shall have to assume that there is no battery ignition system and that you expect to install a dual ignition system. The standard Bosch wiring diagram shown in Fig. 17 for a dual system of ignition will apply in your case. It is not necessary to have the lead come all the way from the storage battery because it can probably be picked up at a more convenient place.

### CARBURETION

#### MANIFOLDING ON TRACTOR

Q—Would it do much good to apply exhaust heat to the manifold of a 12-25 Avery tractor? I placed the carburetor directly above crankshaft so as to have the same distance and a downward slant of manifold to each cylinder. This tractor is equipped with a model M (1 1/2 in.) Stromberg carburetor recommended by Stromberg Motor Devices Co. It operates considerably better with these changes but still loads up when using kerosene. On a heavy pull it will smoke for a short time and stop unless choker is pulled up to enrich mixture. If the high speed needle is adjusted to give a richer mixture it will commence to smoke and keep losing power until it will not pull even a light load. Will not operate without hot air even in summer. Would it be advisable to include all of manifold for exhaust heat or apply the heat at bends only? Tractor operates better now than when received from factory.—John L. Nelson, Symerton, Ill.

From your description of the work you did on this tractor we judge that the reconstruction of the manifold system appears now as shown in Fig. 19. The carburetor is directly over the crank-

### Wiring Diagram of 1913 Hudson Using Delco System

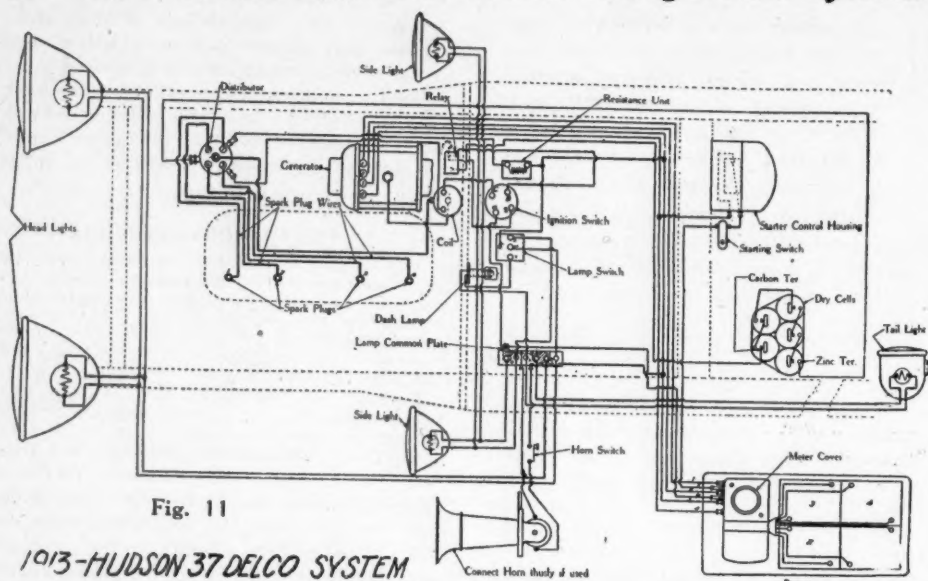
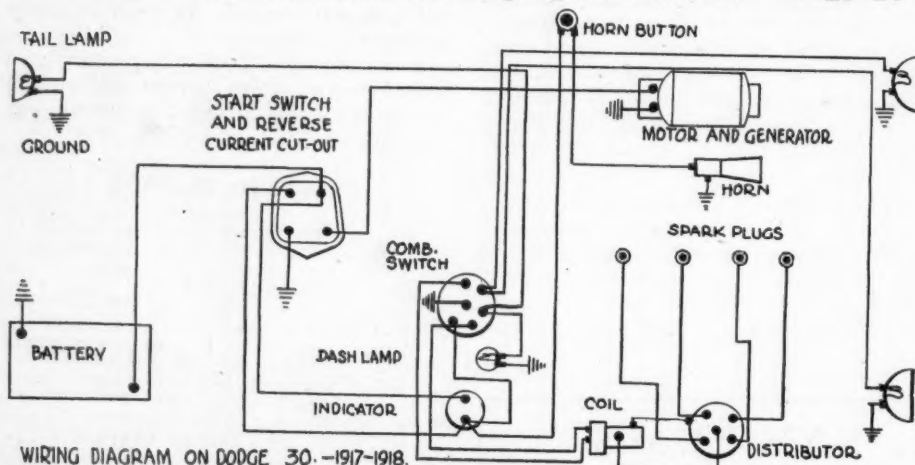


Fig. 11

1913-HUDSON 37 DELCO SYSTEM

### Wiring Diagram of the Dodge Brothers 30—1917-18



WIRING DIAGRAM ON DODGE 30.—1917-1918.

Fig. 12

### Wiring of 1916 Regal Using Dyneto System

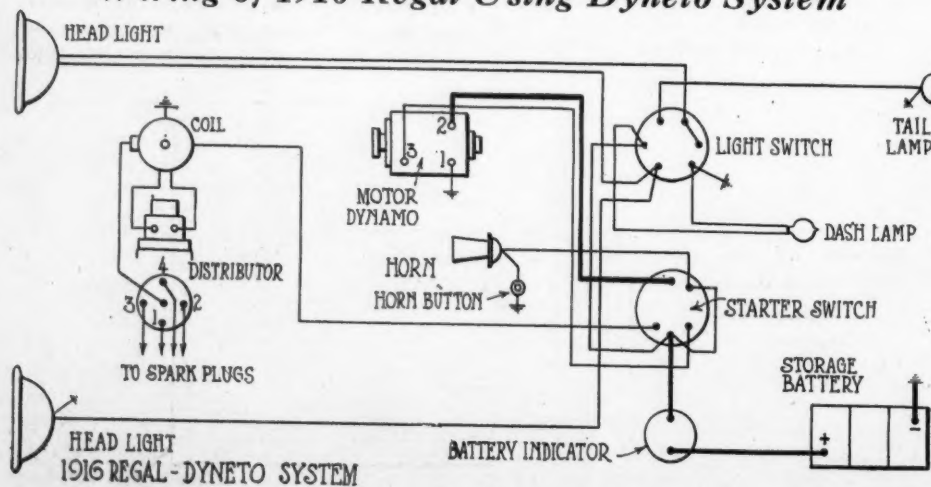


Fig. 13



## Wiring of 1917 Hupmobile-Westinghouse

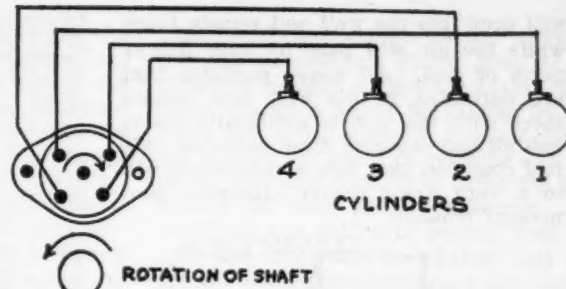
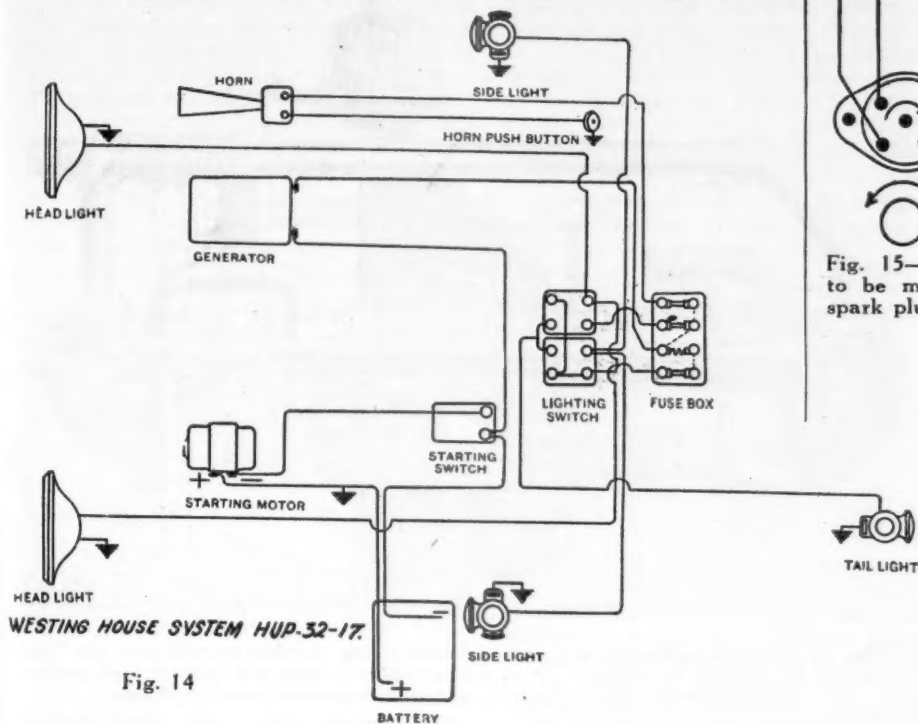


Fig. 15—Diagram showing proper connections to be made between magneto distributor and spark plugs on the Model 35 Oakland equipped with an Eisemann magneto

section of the manifold is encountered, place a T connection with the vertical outlet of the T of larger diameter than the other connections. Then screw into the T a short nipple of about 3 in. length with a cap on the bottom. The whole T connection should now be incased with a sheet metal housing, allowing the hot gases to enter at the top and be exhausted at the bottom.

Then a hot air stove will have to be fitted over the exhaust pipe as shown so that the hot air will be admitted to the carburetor as it is done now. The action of this arrangement needs but little explanation. The heavy particles of fuel

shaft and the leads to the engine head consist of "down hill" pipes as shown. From the standpoint of equal distribution distances this arrangement is probably satisfactory, but there is one thing that has not been considered. It is almost axiomatic that the manifold on low gravity fuel systems should never have "down hill" bends in them. Wherever this is the case, the fuel that has gotten by the carburetor without being completely vaporized is bound to start an accumulation at the top of the "down hill" bend and gradually acquire greater quantities in the drops and puddles as they run down the inside of the manifold. It is a common experience to witness the action of rain drops on a train window. A small drop of water at the top of the window will slowly settle or run to the lower edge of the glass, but as the drop descends it runs into other drops on the way down, and so by the union and combination of a number of drops, one large drop is formed that has sufficient weight and volume in it to allow its tearing away from the attracting glass and run rapidly to the bottom. So it is in the manifold of an engine, and more so where the fuel consumed has lower volatility than gasoline.

The loading that you are experiencing is an effect that is very much like the accumulating rain drop on the train window, and to overcome the situation we advise the following changes in your layout:

It will be very difficult and practically impossible with the present arrangement of engine parts to place the carburetor below the crankshaft in order to provide an uphill path to the engine. Therefore, we would advise leaving the manifolding as you now have but changed as shown in Fig. 18. At the bottom of the downward bend, where the horizontal

## Internal Wiring of Deaco Type 0X6 Generator

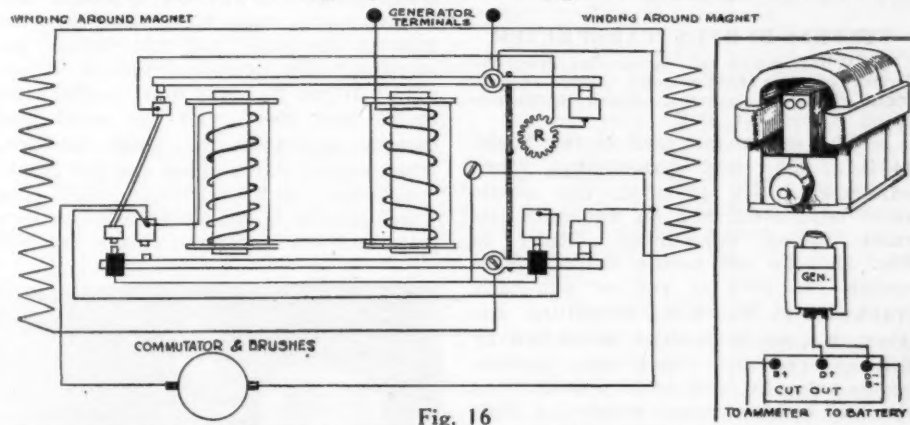


Fig. 16

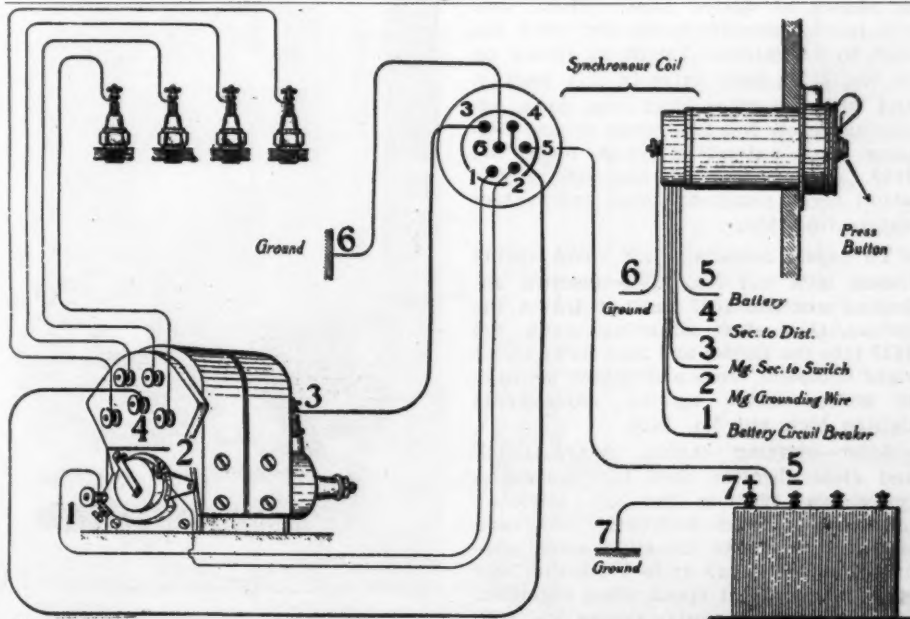


Fig. 17—Standard dual system for Bosch magneto installation

will drop into the well and remain there while the air will pass by with lighter parts of fuel. All heavy particles that are entrained in the well will remain there until the well is sufficiently hot to boil off and vaporize these particles. We feel confident that this arrangement will to a very great degree eliminate your present troubles.

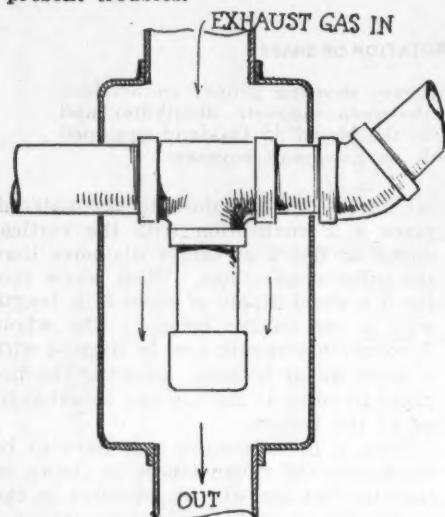


Fig. 18—This shows in detail the arrangement of the heated fuel vaporizer pot. The heavier particles drop into this small chamber and are then vaporized off

#### STEVENS-DURYEA CARBURETER

Q—What make of carbureter has the Model 14 Stevens-Duryea? Give adjustment of the carbureter.—Hugh B. Hutchinson, Vancouver, B. C.

1—The carbureter used in the Model 14 is of their own manufacture. Two adjustments are provided, the needle valve adjustment and an automatic air valve spring adjustment. Refer to Fig. 20. To set needle valve release spring No. 1651 at end of automatic crank lever No. 1639, permitting the lever to drop to position as shown by dotted lever and which also permits needle valve No. 1648 to drop to the stop No. 1686 inside of spray nozzle No. 1685, as shown by dotted lines. Then, with one hand, raise automatic air valve No. 1620 to its extreme height by lifting up on No. 1628; hold valve in this position and with the other hand turn down adjusting screw No. 1656 until it just contacts with automatic crank lever No. 1639. Then back off adjusting screw about seven complete turns, and replace spring No. 1651.

To adjust automatic air valve spring loosen lock nut No. 1626, unscrew adjusting nut No. 1627 until it leaves the thread, then start adjusting screw No. 1627 into the thread and turn down about eight complete turns and engine is ready to start. After making adjustments tighten lock nut No. 1626.

After starting engine, retard spark and close throttle, then turn adjusting screw No. 1656 to the left (closing) until engine runs unevenly, then turn adjusting screw to the right about one-half turn (opening) or to a position that engine shows best speed when throttled.

Automatic air regular spring No. 1630 should have just enough tension to hold

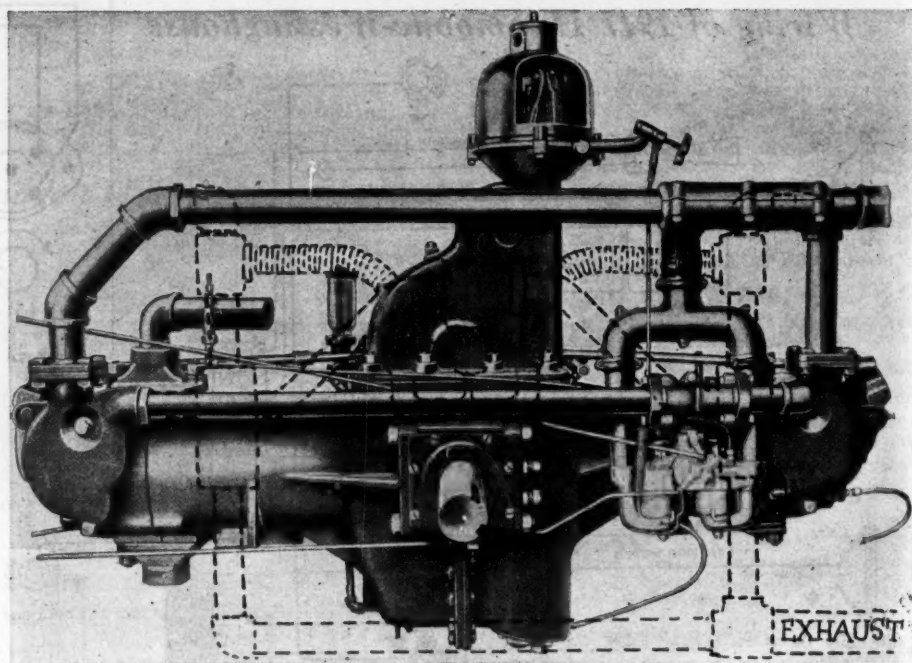


Fig. 19—Diagram showing the regular manifolding on this tractor with the new system as devised by reader. It is our suggestion that the heated fuel pot be inserted in the line at the bottom of the downward bend as shown

automatic valve No. 1620 just closed when engine is throttled down.

With engine running, advance spark lever about halfway on quadrant and throttle lever about 1 in. open, turn No. 1656 to the right and left, noting the increased and decreased speeds of engine. Adjust No. 1656 until engine runs at its best speed with the spark and throttle levers in the above position. When engine shows speed and hill climbing power and carbureter only pops when throttle is suddenly opened a very little increase tension on spring No. 1630

(i. e., turning No. 1627 to the right) or increased gasoline supply (i. e., turning adjusting screw No. 1656 to the right (opening) will overcome this condition.

### Miscellaneous

#### CAR SPEEDS

Q—What speed will a Harroun car make with 3 to 1 gears? What speed has this car with the ordinary gears from the factory? The engine is valve-in-head, with spark plug right over the pistons. Has this engine any advantages over any other valve-in-head with spark plugs right over the pistons?—O. E. Olson, Froid, Mont.

The Harroun engine develops its maximum hp. at 2400 r.p.m. At this engine speed with 30 by 3 tires and a gear ratio of 3 to 1 the car ought to make about 71 m.p.h. With the standard gear ratio of 4 to 1 the car ought to make about 54 m.p.h. From the horsepower developed and the general performance of the engine it apparently has no features which would distinguish it from other overhead valve engines of the same size.

#### BUICK CLUTCH

Q—Advise how to take apart the clutch and transmission used on the Buick D-45.—Elk River Garage, L. H. Young, Elk River, Idaho.

To disassemble the clutch and transmission the car should first be jacked up and suspended with a crane so as to remove the weight of the body and permit the removal of the spring saddle of the rear axle. Next remove the axle by taking out the cap screws which fasten the driving yoke to the driving ring at the rear of the transmission. After the rear axle has been entirely removed, remove the transmission assembly from the bell housing by backing out the cap screws and backing off the nuts, after which the transmission ought to slip off without any trouble.

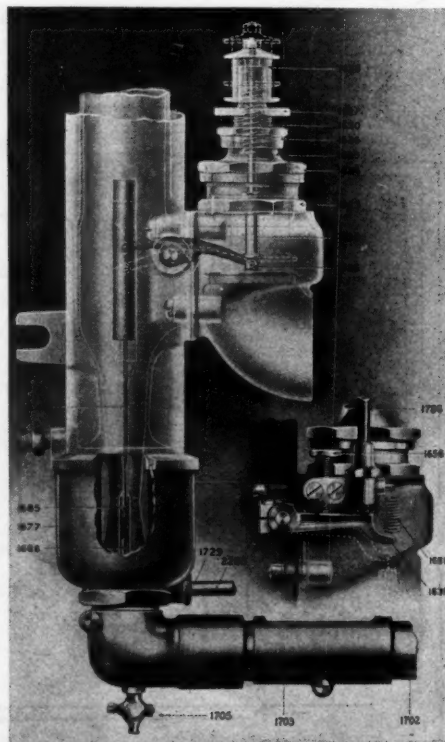


Fig. 20—Cutaway view of the model Stevens Duryea carbureter



The clutch can then be removed by putting pressure on the clutch spring and removing the lock nut which fastens to the clutch spring stud. Care should be taken in handling this spring as it is very strong and might easily cause a lot of damage if permitted to expand suddenly. In order to disassemble the transmission the first operation would be to remove the cover and handle control assembly. Next, remove the clutch gear and front bearing after the inner bearing cap screws have been removed. Remove the end plate housing with the counter shaft and reverse idler gear shaft and the end plate including the rear bearings. The transmission is then completely apart and will permit the installation of new bearings.

### STUDEBAKER CLUTCH

Q—Publish a diagram of the Studebaker Light Six clutch and explain the method of adjustment.

A diagram showing a section of the clutch and transmission assembly is shown in Fig. 21. The clutch is of the single dry plate type. The driven member is a single malleable disk placed between two friction disks. Six coil springs are used to exert pressure on clutch toggle plate, acting upon friction plates and malleable disk located between the toggle plates and the flywheel. Details are shown in Fig. 21. The clutch is released by the toggle lever collar being pulled back against the three toggle levers which operate toggle plate, thereby relieving pressure on the friction surfaces.

The toggle lever should be adjusted so that, with the clutch pedal released, there is a slight play between ends of levers and toggle lever collar. This play must be the same amount for each lever so clutch is released an equal amount at all points. To make adjustment, first loosen lock nuts on toggle arm adjusting screws. Then turn screws to left to increase play between the toggle levers and collar or turn to the right to decrease. Under no circumstances should the levers be tight against collar when the clutch pedal is released, as clutch will be partially disengaged and slipping will result.

In the case of a new car or after new friction disks have been installed, it may be necessary after 500 to 1000 miles of running, to readjust the levers which may bind on collar caused by the friction disks running into a smooth surface and becoming thinner. After disks have worn smooth no further adjustment will be necessary for some time. When the disks are badly worn it will be necessary to install new ones. The braking action on the clutch occurs when grease retainer nut of the clutch throw-out bearing is brought in contact with leather-faced flange, which is a part of the flexible coupling spider, keyed to the clutch drive shaft. There is no adjustment to this brake, and it requires no care except that of replacing the leather facing when worn.

### MACHINING PISTONS

Many service stations finish their own pistons and, of course, there are many

methods of handling a piston to get the best results. The following method has been suggested by J. Arthur Glatly, one of our readers. There is an objection to using a 60 deg. cone center because of the tendency to enlarge the bottom of the piston in case of excessive pressure being applied to the tail center. Another objection is the tendency to produce a tapered piston in case of a slightly loosened tail stock center or in case the tail stock is out of alignment.

Another objection where a center is used in the top of a piston is the inability to produce a smooth finish on the top of the piston and this is very essential as carbon has much less tendency to adhere to a perfectly smooth surface. The inside of the lower end of the piston should be made a certain standard bore for each size piston.

Instead of using a 60 deg. fore plate use a fore plate with a series of steps to accommodate the various size pistons. The step should be a dowell fit for the piston. The fastening should be accomplished by means of an eye bolt passing through the spindle attached to the piston by inserting the connecting rod bushing and tightened by means of a nut acting against the back end of the spindle. By this method a perfectly uniform diameter will result, and a smoother job will be obtained as there will be no possibility of chattering through a slight looseness of the tail center. This method will also permit buffing and polishing the piston heads.

### WORN SPLINE SHAFT

Q—The transmission in a Hudson 1918 model is very noisy when in low and intermediate gears, but perfectly quiet in high. I have renewed both sliding gears and all the bearings and thrust washers, but it still makes the same growling noise. There is a little wear in the spline shaft and the shifting forks. Could this cause the gears to growl?—Frank R. Kutschenreuter, San Antonio, Texas.

Excessive wear on the transmission

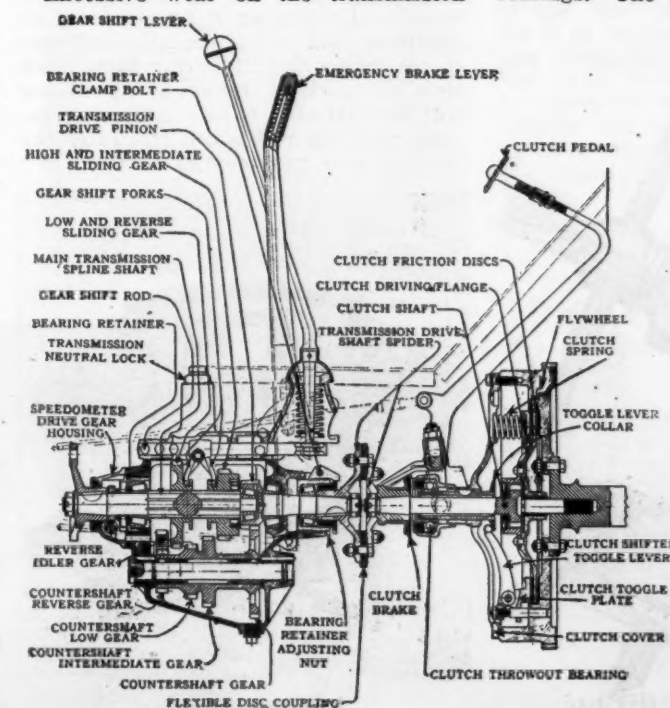


Fig. 21—Sectional view of the Studebaker Light Six clutch and transmission assembly

main shaft and splines would cause a low and intermediate sliding gear to run eccentric causing a growling noise. This same condition could be caused by the gears not being properly matched, as at the factory the gears in question are run in dry and then with oil to offset the possibility of high spots. However, this condition was evidently present both before and after the installation and the remedy would obviously be a new spline shaft.

### ENGINE AND CAR SPEEDS

Q—How fast does an Essex engine turn over when car is geared 4 2/3 to 1 and traveling at 73 m.p.h.?

2—How many r.p.m. is an Essex engine making in a car geared with axle ratio of 5 1/11 to 1, traveling 68 m.p.h.?—A. B. Hutchinson, Strawberry Point, Iowa.

1—The power curve of the Essex engine shows that the maximum hp. is attained at an engine speed of 2800 r.p.m. If you have a stock job it is impossible to get a speed of 73 m.p.h. with a gear ratio of 4 2/3 to 1 for the engine would have to be turning over at a speed of about 3800 r.p.m.

2—With a gear ratio of 5 1/11 to 1 it is more of an impossibility as the engine will have to be turning over at a speed very close to 3900 r.p.m.

### WORN BEARINGS.

Q—Where can parts for the Warner speedometer be obtained?

2—What would be the probable cause of a grating noise similar to the noise produced when pulling hard in reverse gear on a 1920 Nash? When the engine is idling there is a sound which apparently comes from the clutch which sounds as if two pieces of steel floating on a shaft were bumping together. When in reverse gear there is a loud howl produced.

1. Parts for the Warner speedometer can be obtained from The Stewart Warner Corp., 1828 Diversey Blvd., Chicago.

2. The noise which develops into a howl under some conditions is probably due to worn clutch and transmission bearings. The clutch thrust bearing is probably badly worn due to driving with the foot riding the clutch. It would be advisable to disassemble the clutch and transmission and make a careful examination of the bearings paying particular attention to the clutch thrust bearing and the countershaft bearing in the transmission.

# The Accessory Show Case

## New Fitments for the Car

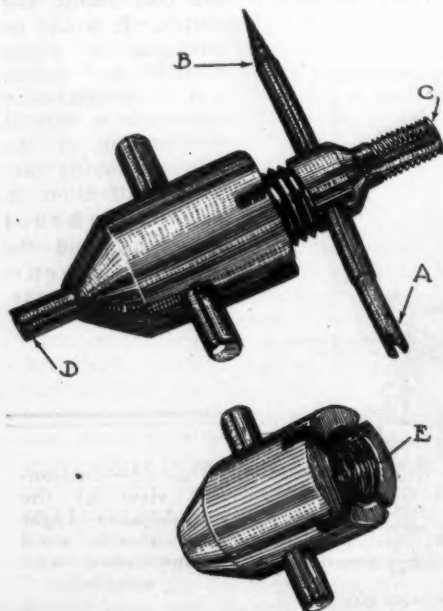
### Five In One Tire Valve Tool

This tire valve tool is intended for the use of service station employees and car owners alike. It is useful in that every conceivable operation on a tire valve can be performed with it. In all there are five working ends, shown by the letters A, B, C, D and E in the illustration. When moving a valve core the inside threads of the stem first are cleaned up by the tap C, after which the core can be removed with slotted end A. It sometimes happens that the tangs are twisted off the core and when this occurs the core can be removed with the end B.

This is a tapered left-hand screw. The fourth working end of the tool is D, or the pulling end. Often the little spring and wire is stuck in the valve stem and the hole in the latter is so small that no pliers or tweezers can be inserted. By placing the chuck end of the tool, or D, into the hole and tightening up on the handle the wire can be withdrawn. The chuck end of the tool is self-centering and thus locates the wire automatically. The fifth working end is E, a die for smoothing up the outside threads of the stem. The tool sells for \$1 and is made by the H. C. Gielow Co., 60 W. Washington street, Chicago.

### Hood Lock

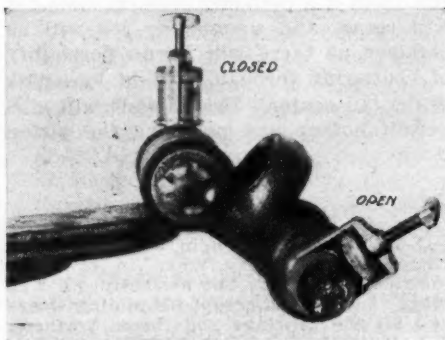
A new hood lock which is easily operated and designed to prevent rattling of the hood is manufactured by the Ideal Brass Works, Indianapolis. Being of the eccentric type this hood lock can be operated with but one finger. It is adjusted by rotating the concentric sup-



Five-in-one tire valve tool

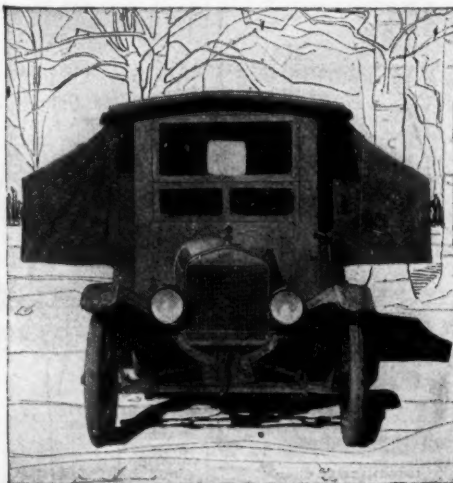


Self-lubricating hood lock



Davis grease cup

port or lock body on the anchor bolt which lengthens or shortens the lock as desired. Lubrication is by means of an absorbent pad which contains sufficient oil for lubricating all moving parts. Each time the lock is released, the anchor bolt automatically is forced into engagement with the pad which lubricates the moving parts. Price \$1.25 each.



Lamsteed kampkar

### Lamsteed Kampkar

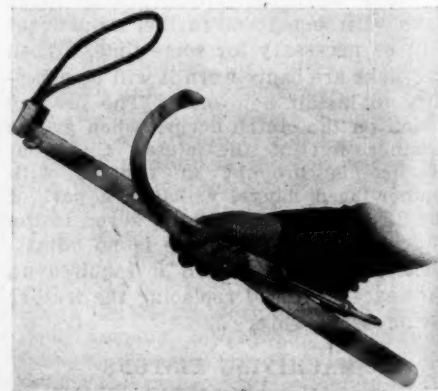
Like an airplane, the Kampkar body is built in sections of light, strong materials. It can be mounted, one section at a time, by two people in about two hours, it is claimed. This sectional feature also allows the body to be taken down and stored in a small space. It can be mounted on any Model T. Ford chassis and has been so designed as not to overload the chassis. Four beds, each 6 ft. 4 in. by 42 in. wide can be fitted and ample locker space for clothes, food, water, gasoline, stove and ice box is provided. When closed, the whole car is no wider than the ordinary Ford sedan, and nothing projects beyond the outer fenders. Camping Car Co., 2100 Locust St., St. Louis.

### Davis Grease Cup

The leading feature of the Davis grease cup is a spring metal plunger which is slightly concave like a shallow saucer. This exerts a firm, uniform pressure against the sides of the barrel which is claimed to make the cup dust and leak proof as well as oil tight. Both oil and grease may be applied with any required pressure. The metal cap is opened and closed each with but one turn, and both the plunger and cap are fastened to the barrel.—Davis Mfg. Co., 1082 Union St., San Francisco.

### Tire Jack

As a tool, the Electric Specialty tire jack is a small flat compact device. The hooks which lift the tire are simply slipped under the tire and the small hook dropped through the hole in the lever. The leverage is such that even with the heaviest tire only a slight effort is required to lift the tire so that the valve stem clears the felloe. After the tire is off the lever is disengaged from the hook and the tire rolled out of the way.—G & W Electric Specialty Co., Chicago.



G & W Electric Specialty tire jack



# Service Equipment Time Savers for the Shop

## Pneumatic Truck Tire Vulcanizing Machine

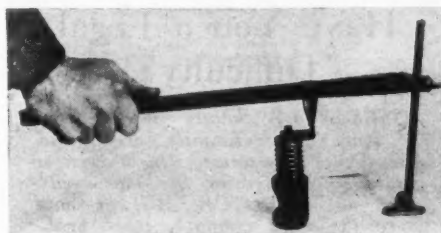
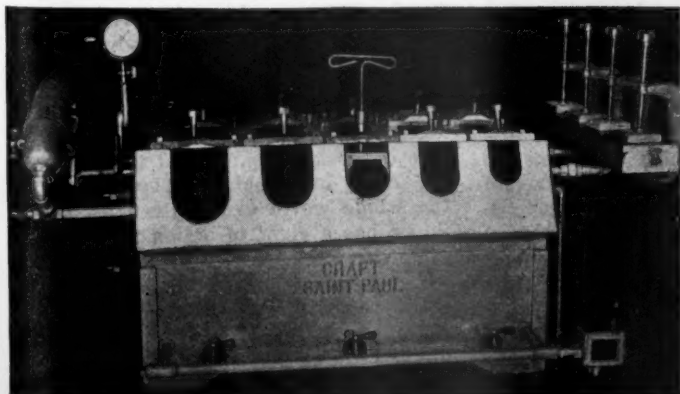
Economy of operation of a vulcanizing machine is important and this is one of the essential features claimed for the Craft vulcanizing equipment. Because of its thick wall and heavy single block type of construction an even temperature is always maintained and 5000 cu. ft. of gas a month is said to be the maximum consumption. The model illustrated consists of the following fittings; nine pair semi-steel bead moulds (five clincher and four straight side), one 24 in. tube plate, one vulcanizing arm, one inside core clamp, two rows of adjustable screw clamps to adjust the bead moulds, four clamps for the tube plate, four hardwood tube blocks, and one gas regulator. Wood-Craft Co., 1485-1489 Marshall avenue, St. Paul, Minn.



Casey-Hudson door control

## Universal Power Drive

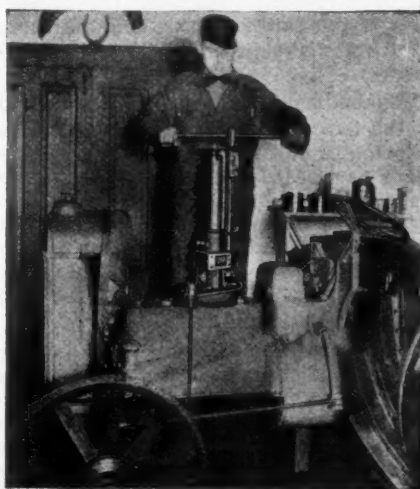
The Universal power drive which is shown attached to the Universal cylinder re boring tool can be operated by the bench or floor type drill press. It can be used with all models of the 1/2 in. portable electric or air drills or with the improved Universal cylinder re boring tool. Is manufactured by the Universal Tool Co., Inc., Detroit, Mich.



Valve spring compressor

## Storm Re boring Machine

A valuable feature of this tool is its adaptability to the different methods of drive. It is regularly furnished with a connection for drill press, but can also be obtained with pulley for belt or motor drive. It does not set directly in front of or over the drill press base, but to one side so it does not interfere with the use of the drill press for other work. Each machine is also provided with a double end wrench for operating by hand so that it may be removed from the base and used for re boring engines without removing them from the chassis. Storm Mfg. Co., Sixth avenue and Fourth street S., Minneapolis.



Above: Storm re boring machine taken from its base and used for re boring an engine without removing it from the tractor

Left: Pneumatic truck tire vulcanizing machine

## Casey-Hudson Door Control

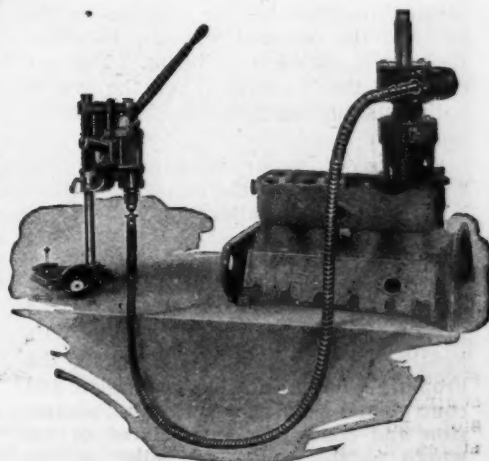
This device, which electrically controls single or double swinging, sliding or folding doors or gates, is manufactured by the Casey-Hudson Co., 357-361 East Ohio street, Chicago. It consists of a small motor, with the necessary fittings which is installed above or at the side of the gate or door and actuated by the pressure of control buttons placed at a distance, to open or close it. It can be used with either direct or alternating current. It is said to be easily installed and can be readily changed from one door to another.

## Valve Spring Compressor

Removing and replacing the valve springs on all types of valve-in-head engines is the purpose of the C & S valve spring compressor manufactured by Culavin & Smith, Dunlap, Iowa. The operation is simple. The bracket is fastened to the top of the work bench about one foot from the edge by means of two wood screws or small bolts. The lever is adjusted to the desired height on the upright by means of the clamp. The opening of the fork is so constructed that any kind of retaining key or lock can pass through it. Price \$2.50.

## Gem Creeper

An automobile creeper made of oak and heavy canvas which can be folded and carried under any car seat is manufactured by the W. J. Broome Mfg. Co., 1016 West 39th street, Los Angeles. The bed is of heavy strap iron with cross supports, and is fitted with double wheel casters and a large comfortable head cushion which can be adjusted to make the creeper 46 in. long. Price \$5.



Universal power drive

# Law in Your Business



## Repair Work Improperly Done

**Q**—A large 1916 Jeffery six cylinder car was overhauled at a small town shop and the shop owner charged the owner of this car \$188.50 for labor. A new crankshaft was installed and the car is still in bad shape. The man who had charge of this is not a mechanic, and it seems was practicing on this car. He threatens to take the car from the owner, although the owner has paid \$200 of the bill, which was \$388 in all. Has he any right to take the car, and what can the owner do about it?—Wm. Tanke, Portage, Wis.

The car owner can defend in any action brought against him to collect the balance on the job, and if action is brought he may set up a counter claim for damages, if any were done to the car. Or if he can show that incorrect charges were made against him, or that he was charged too much, or that the work and service was valueless and not what was contracted for, then the claim may be reduced by just the amount shown.

In Wisconsin under the Garagekeepers' Lien Act the garagekeeper may retain possession of the car to enforce his lien, the same as at common law. Also he may allow the owner to have the car and retain his lien, but where the property exceeds the value of one hundred dollars, the lien may be enforced against the property only by going into a court having jurisdiction.

## Garagekeeper's Title One of Possession

**T**HE relation existing between a garagekeeper and his customer storing his car is one of contract. This contract may not be expressed but the law will imply one.

When the garagekeeper takes charge of a car for storage he becomes what is termed the "bailee" in relation to the car and the contract whereby he holds the car is called a bailment. The car owner is the "bailor." Then the law of bailments applies to the storage of automobiles.

Storage of motor vehicles with the garagekeeper is for the mutual benefit of both parties, the bailor and bailee; the garagekeeper being what is commonly called a "bailee for hire." The bailee here becomes liable for the safekeeping, custody and care of the property placed in his possession and control. His liability attaches immediately upon the property coming into his possession and control and continues until the possession and control is surrendered or restored to the owner or bailor of the property, or his order or assigns, or to

By Wellington Gustin

## Have You a Legal Difficulty?

*SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer, but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted to him.*

the rightful owner if there is a dispute over the ownership.

The relation of bailor and bailee can be terminated at the will of the owner of the car by paying for the custody. Therefore the garagekeeper may ordinarily retain possession of the stored property until he has been paid for his storage charges. This is the common law lien. However the keeper must be ready at all times to deliver a stored car upon reasonable demand, for the purpose of the bailment has then and there been accomplished. (Van Zile on Bailments.)

The bailment may also be terminated by the total or partial destruction of the automobile or other property, as where some has been destroyed by fire or is lost. Again where the keeper, or bailee, disposes of the property contrary to the contract of bailment the relation is terminated. Where the bailee misuses the property left in storage this may also terminate the contract.

Such garagekeeper has only a possessory right to the stored article, and this right to its possession ends whenever he is guilty of fraud, bad faith, or a misuse of the property. His title is good for no other purpose than to care for it, during the continuance of the relation of bailor and bailee in accordance with the contract and this contract requires that he redeliver the property to the bailor upon its termination.

While the garagekeeper only has the right of possession that title is paramount to any other, except as to the title of the owner and as long as the bailment exists, even the owner himself cannot disturb the bailee's right to possession custody and use to the extent of the contract, or where such use is necessary to the property to protect it from loss or injury.

As bailee for garagekeeper may bring and maintain an action against anyone except the bailor on the theory that his



## Mortgage Lien vs. Mechanics' Lien

**Q**—If a garagekeeper does a great deal of labor and puts a large amount of accessories on a car, can he hold it for his pay if the car is mortgaged?—W. J. Sampier, Sansom, Texas.

The question you put has been answered "yes" by the courts of Texas, and a few other states. Most of the states, however, have held the prior lien of a mortgage superior to a subsequent mechanic's lien, and so the reader must look to what the courts of his own state have held in the matter.

The theory on which the priority of the lien for repairs is based is that the seller, or holder of a chattel mortgage, by permitting the property to remain in control of the buyer or mortgagor, gives the latter the implied authority to have necessary repairs made and to give the repairman a superior lien for such repairs and work. This is the doctrine as set up in Texas.

Also, the Texas law is declaratory of the common law lien, and possession must be retained or the lien is lost.

In the case of City National Bank vs. Laughlin, 210 S. W. 617, the same question you ask was passed upon by the court of civil appeals of Texas. It stated the priority rule between the two liens to be:

"While the decisions are not altogether in accord, the weight of authority seems to favor the rule that, where a mortgagee of chattels is permitted to retain possession and use the same, and the property and use thereof is of such nature that it may be reasonably expected that from such continued use during the term of the mortgage repairs will probably be necessary, and repairs are made which enhance the value of and preserve the property, then the mechanic or artisan making such repairs under such conditions has a lien on the article repaired superior to the lien of the mortgagee. The repairs in such cases are for the benefit of both the mortgagor and the mortgagee, and the mortgagee may be held to have impliedly authorized them."

title or possessory interest is equivalent to actual ownership and good against the whole world except the true owner. So he has a right of action for damages to a car while stored with him. However, the custody does not extend to the garage man the right to allege ownership for the purpose of securing and suing out a criminal complaint for larceny or theft of the automobile.

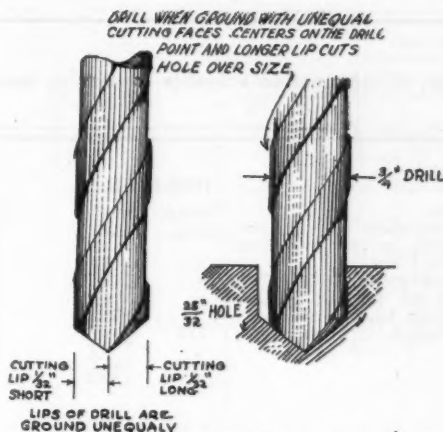


# The Automotive Repair Shop

## Practical Maintenance Hints

### Grinding Drills for Over-size Drilled Holes

Frequently a drilled hole is required for which purpose a drill the exact size is not available. An undersize drill can be made to drill oversize under these conditions by grinding the cutting lips of the drill unequally. The reason for this is due to the drill centering on the drill point, causing the widest cutting lip to turn a circle about this center. By running the drill fast and not crowding it too much, a  $\frac{3}{4}$ -in. drill can be made to cut 1-32 in. oversize.



then apply it to the repaired section taking great care to fit it exactly to the tread pattern. Then cure the section as usual. When the job is done it will be found that the tread on the new section can hardly be distinguished from the rest of the tire.

### Shield for Catching Pins

This shield or "catch the pins" can be made from a piece of tin with a pair of snips. It is designed to place under the valves while marking them in order to keep the valve spring retainer pins or washers as used on the new Studebaker light six from dropping into the crankcase, as these are open under the rocker arm.—M. L. Smith, Orange, Calif.

Mechanical problems are being solved in repairshops every day. You, perhaps, have devised a time and labor-saving device. Send us a brief description and a sketch showing how it operates. Give your name and address. MOTOR AGE will send you a dollar for every idea accepted and published.

### Marking the Cotter Pin Hole to Save Time

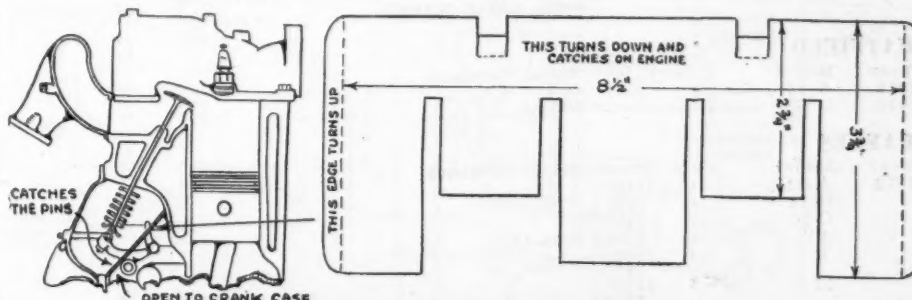
To mark the position of the cotter pin hole in the end of a bolt before assembling the nut, may not appear to have much in its favor. However, it requires less time to make a small mark on the end of a bolt in line with the cotter pin, screw the nut to this position and insert the cotter than it does to leave it unmarked and locate the position of the cotter pin hole after the nut is pulled tight. It takes only a fraction of a minute to scratch a mark on the end of the bolt with a file, but this mark is easily lined up with the slots in the castellated head of the nut and on a job of replacing connecting rod caps under the car, these notches simplify and expedite the work.

### Forming Tread Patterns

In repairing a blowout in a tire it is desirable to reproduce the tread pattern in the repaired section. Perhaps the simplest way to do this is as follows: Strip a layer of fabric from an old tire and cut it into two sections the length of each section being somewhat longer

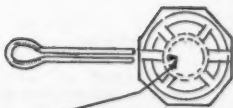
than the repaired section of the tire. Sandwich a layer of tread stock between holding it to the fabric with vulcanizing cement—if the tread pattern is deep two layers of tread stock should be used.

Apply this boot to a perfect section of the tread and put it in the vulcanizer for about 10 min. or long enough for the boot to take the tread pattern. Remove the tire, soapstone the foot liberally and



Shield to prevent pins from dropping into crankcase

THIS SIMPLE MARK IN LINE WITH HOLE FOR COTTER PIN SIMPLIFIES AND EXPEDITES THE WORK



THE LOCATION OF THE COTTER PIN HOLE IS EASILY DETERMINED WITH THE GUIDE MARK

WITH A FILE IT TAKES ONLY A FRACTION OF A MINUTE TO MARK THE POSITION OF THE COTTER HOLE

Marking the cotter pin hole saves time



A very convenient and efficient arrangement of lights for washing cars which can be quickly adjusted for illumination of body or gears. This will promote thoroughness as well as speed of doing the work.—Windsor Park Auto Station, Chicago

# Passenger Car Serial Numbers

## Motor Age Maintenance Data Sheet No. 145

One of a series of weekly pages of information valuable to service men and dealers—save this page

Continued from last week

### HAL

Year	Model	Cyls.	Price	Serial Numbers
1916	12	12	\$2100	Can be distinguished by straight windshields and carpet paneling on back of front seat
	12	12	2385	Introduced September, 1916. Can be recognized by walnut paneling on front seat back
1917	12	12	2600	A new pocket-style tire carrier is fitted
1918	25	12	\$600	
	Discontinued			

### HANSON

Year	Model	Cyls.	Price	Serial Numbers
1918	A-45	6	\$1685	1001-1025
1919	A-45	6	1685	1026-1625
1920	-----	6	-----	1700 up
				Number on right side heel board under front seat; engine numbers left side crankcase

### HARROUN

Year	Model	Cyls.	Price	Serial Numbers
1917	A-A-1	4	\$695	101-549
1918	A-A-1	4	895	550-2381
1919	A-A-1	4	995	2382-2624
				Number plate on right side front seat, under cushion

### HATFIELD

Year	Model	Cyls.	Price	Serial Numbers
1919	A-42	4	-----	678
1920	A-42	4	-----	700 up

### HAYNES

Year	Model	Cyls.	Price	Serial Numbers
1912	A-21	4	\$2100	
	B-21	4	2450	
	C-21	4	2750	
	AY	4	3000	3036-4851
	Y	4	3800-	
			3900	
	22	4	2250-	
			2750	
1913	22	4	3400-	
			3500	
	23	6	2500	5000-6550
	24	4	1785	
	25	6	2700	
1914	26	6	2700-	
			3200	
	27	6	2785-	6601-8499
			3830	
	28	4	1985-	
			2700	
1915	32	4	1660-	
			2500	
	30	6	1485	8552-10949
	31	6	2250-	
			3000	
			1550	
1916	34	6	1385	
	34	6	1485	
	35	6	1495	
	37	6	1725-	10951-15999
			2250	
	36	6	1595-	
			1750-	
			2150	
	41	12	2225-	
			2890	
	40	12	2095-	21000-24000
			2760	
1917	36	6	1595-	
			2260	16002 up
	37	6	1725-	
			2390	
1918	38-39	6	2150-	29650 up
			3250	
	44	12	2910-	21000-24000
			3985	
1919-20	45	6	2685-	32894 up
			4200	
	46	12	3450-	21364 up
			4200	Number plate on cowl at extreme right; also on timing gear housing.

### HOLLIER

Year	Model	Cyls.	Price	Serial Numbers
1915	158T	8	\$985	1-580
	158R	8	985	1-60
1916	168T	8	985	580-623
1917	176T	6	1085	1-35
	176R	6	1085	1-35
	178R	8	1185	1-51
1918	186T	6	1185	6194-7010
	188T	8	1385	
1919	206T	6	1785	10001-10083
1920	206B	6	1985	10083 up
				Number on heel board of front seat

### HOLMES

Year	Model	Cyls.	Price	Serial Numbers
1918	1	6	\$2900	1-500
1919	2	6	2900	500 up
1920				20001 up
				Number plate on right rear frame

### HOWARD—See Lexington

### HUDSON

Year	Model	Cyls.	Price	Serial Numbers
1912	33	4	-----	15001-30000
1913	37	4	-----	30001-56500
1914	54	6	-----	56501-61700
	40	6	-----	63001-77201
1915	40	4	-----	73501-90000
	54	6	-----	59001-62000
1916	40	4	-----	G10001-G40000
1917	H	6	-----	H1-H99999
	J	6	-----	1-96499
	4J	6	-----	75000-97999
1918	M	6	-----	5000-97499
1919	O	6	-----	5000-90999
				5000 up
				27000 up
				30000 up
				49000 up
				50000 up
				59000 up
1920	O	6	-----	60000 up
				61900 up
				70000 up
				81000 up
				82000 up
				84000 up
				90000 up
				91500 up

### HUFFMAN

Year	Model	Cyls.	Price	Serial Numbers
1919	W	6	\$1795	

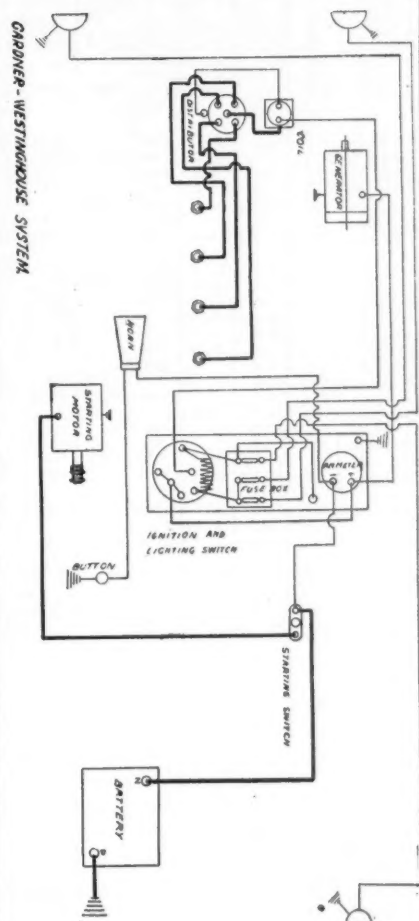
### HUPMOBILE

Year	Model	Cyls.	Price	Serial Numbers
1912	16-20	4	\$750	25001-28902
	20	4	900	
1913	20	4	750	
	H	4	{ 1000	28903-40000
			{ 1100	
1914	H A	4	1200	40001-52000
	32	4	1050	Number on sector plate center of dash
				52001-60000
1915	K	4	1200	
	N	4	1085	
1916	N U	4	1185	
	N U	4	1340	60000-87519
1917	N U	4	1285	
	N U	4	1440	
	N U	4	1385	
				Number plate on dash near speedometer
1918	R	4	{ 1250	R1-R15000
			{ 1350	
1919	R	4	1350	
	R3	4	1450	R20001 up
				Number plate on dash at steering column

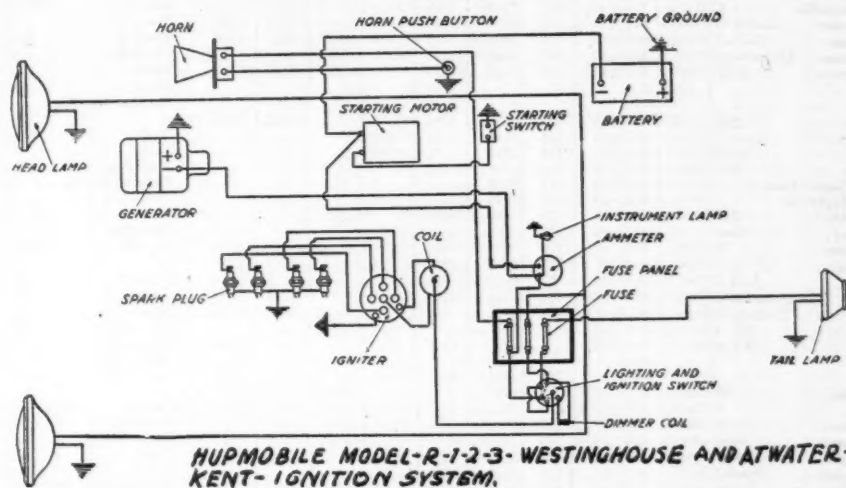


# Motor Age Weekly Wiring Chart No. 123

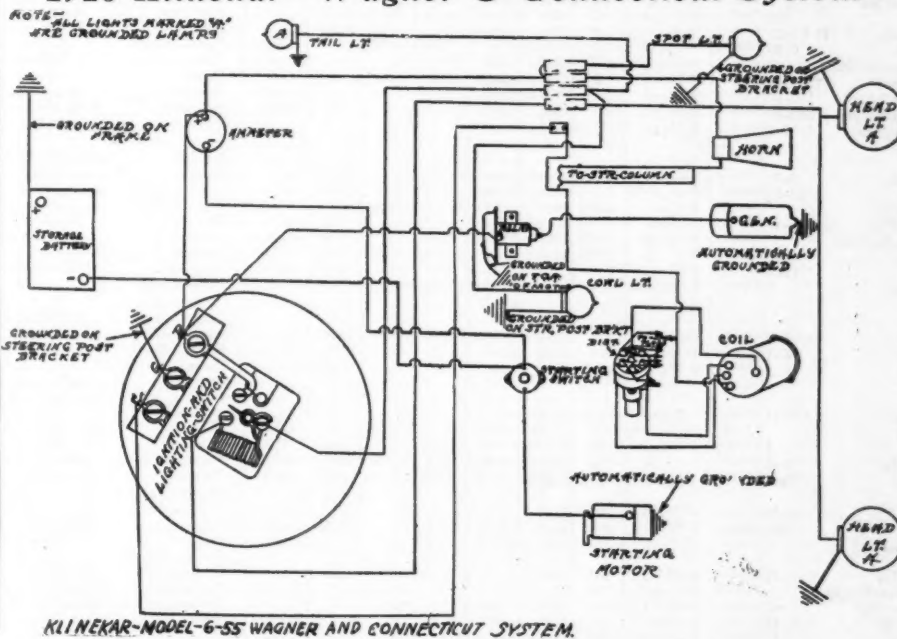
## 1920 Gardner Westinghouse System



## 1920 Hupmobile—Westinghouse & Atwater Kent System



## 1920 Klinekar—Wagner & Connecticut System



### Name of Car and Date on Which Wiring Diagrams Have Appeared in Previous Issues

Allen—Sept. 30, '20  
American Beauty—Feb. 17, '21  
Buick—Dec. 23, '20  
Cadillac—Nov. 18, '20  
Case—Oct. 7, '20; Feb. 17, '21  
Chalmers—Feb. 24, '21  
Cleveland—Feb. 24, '21  
Cole—Dec. 9, '20  
Jan. 6, '21; Jan. 20, '21  
Daniels—Feb. 17, '21  
Dorris—Dec. 9, '20;  
Feb. 24, '21  
Elcar—Oct. 28, '20  
Dec. 2, '20

Elgin—Oct. 14, '20  
Elkhart—March 3, '20  
Franklin—Dec. 2, '20  
Grant—Nov. 25, '20; March 31, '21  
Hudson—Jan. 13, '21  
March 17, '21  
Hupmobile—Feb. 3, '21  
Jackson—March 17, '21  
Jordan—March 10, '21  
King—March 3, '21  
Kissel—Oct. 21, '20  
Lexington—Dec. 16, '20  
McFarland—March 24, '21  
Mercer—March 24, '21  
Mitchell—Jan. 6, '21

Moore—Nov. 11, '20  
Moline-Knight—Nov. 4, '20  
Monitor—March 31, '21  
National—Dec. 16, '20  
March 10, '21  
Oakland—March 24, '21  
Oldsmobile—Sept. 16, '20  
Nov. 25, '20  
Dec. 23, '20  
Packard—Oct. 7, '20  
March 31, '21  
Paige—March 10, '21  
Peerless—Nov. 18, '20  
March 3, '21  
Premier—Feb. 10, '21  
Reo—Feb. 10, '21

Roamer—Dec. 30, '20  
Feb. 10, '21  
Saxon—Oct. 21, '20  
Dec. 30, '20  
Scripps-Booth—Feb. 3, '21  
Sheridan—Feb. 3, '21  
Stearns—Nov. 4, '20  
Jan. 13, '21  
Stephens—Sept. 16, '20  
Studebaker—Oct. 29, '20  
Velie—Jan. 20, '21  
Willys-Knight—Oct. 14, '20

Additional Wiring Diagrams May Be Found in the Readers' Clearing House in This Issue

## Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan	NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ace.....G	Guy	6-31x5	123	32x4	\$2975	\$2975	.....	\$3680	\$3680	Maibohm.....B	Own.	6-31x4 1/2	116	32x4	1575	1575	1750	2395	2395
Ace.....H	H-S.	6-31x5	123	32x4	2975	2975	.....	3680	3680	Marmont.....34	Own.	6-31x5 1/2	136	32x4 1/2	5300	5000	5000	6150	6600
Ace.....L	H-S.	6-31x5	116	32x4	2260	2260	.....	.....	.....	Maxwell.....25	Own.	4-31x4 1/2	109	30x3 1/2	995	995	.....	1595	1605
Allen.....Series 43	Own.	4-31x5	110	32x4	11395	1395	.....	.....	2395	McFarlan.....1921	Own.	6-41x6	140	33x5	6300	6300	6300	7500	7500
Ambassador.....R	Cont.	12-21x5	136	32x4 1/2	.....	.....	.....	.....	.....	Mercer.....Series 5	Own.	4-31x6 1/2	132	32x4 1/2	4500	4500	4500	5700	6200
Amc.....1921	H-S.	4-31x5	114	31x4	.....	.....	.....	.....	.....	Merit.....Cont.	Own.	6-31x4 1/2	119	32x4	2245	2245	.....	.....	.....
American Six.....C	H-S.	6-31x5	127	32x4	2395	2395	\$2475	3295	3495	Meteor.....R & R	Dues.	4-41x6	129	32x4 1/2	5500	5500	.....	.....	.....
Anderson.....Series 40	Cont.	6-31x4 1/2	120	33x4	2195	1795	1845	2795	2795	Metz.....M6	Rut.	6-31x5	120	32x4	1995	1995	.....	2795	2885
Apperson.....8-21-S	Own.	8-31x5	130	34x4 1/2	.....	13500	3500	4500	4500	Mitchell.....F-40	Own.	6-31x5	120	33x4	1750	1750	1950	2800	2900
Apperson.....Anniversary	Own.	8-31x5	130	34x4 1/2	.....	14250	4250	.....	.....	Mitchell.....F-42	Own.	6-31x5	127	34x4 1/2	.....	1995	.....	.....	.....
Auburn.....6-39	Cont.	6-31x4 1/2	120	33x4	1745	1695	1695	2795	2795	Moller.....A	Own.	4-21x4	107	27x3 1/2	2000	.....	.....	.....	.....
Borgess.....20T	Cont.	6-31x4 1/2	120	33x4	1885	1885	.....	2785	2885	Moore.....6-48	Cont.	6-31x4 1/2	122	32x4	2285	2185	2685	3185	3185
Bel.....4-32	H-S.	4-31x5	114	31x4	.....	1495	.....	.....	.....	Murray-Mac Six.....8-31	Own.	8-31x5	128	34x4 1/2	4250	4250	4250	.....	.....
Bel.....6-50	H-S.	6-31x5	124	32x4	.....	1695	.....	.....	.....	Nash.....681-7	Own.	6-31x5	121	33x4	1695	1695	1850	2650	2895
Biddle.....B-1	Buda	3-31x5 1/2	121	.....	.....	.....	.....	.....	.....	Nash.....682	Own.	6-31x5	127	34x4 1/2	1395	1395	1875	1985	2185
Birch Super Four.....H-S.	4-31x5	117	33x4	.....	.....	.....	.....	.....	.....	Nash Four.....41-4	Own.	4-31x5	112	32x3 1/2	1395	1395	.....	.....	.....
Birch Light Six.....H-S.	4-31x5	117	33x4	.....	.....	.....	.....	.....	.....	National Sixtel.....BB	Own.	6-31x5 1/2	130	32x4 1/2	3750	3750	4900	4950	.....
Bour-Davis.....21S	Cont.	6-31x5 1/2	126	33x4 1/2	2585	2585	.....	.....	.....	Nelson.....D	Own.	4-31x4 1/2	104	32x4	1900	.....	.....	.....	.....
Bradley.....Four	Own.	4-31x5	116	33x4	.....	1265	.....	.....	.....	Noma.....1C	Cont.	6-31x4 1/2	128	32x4 1/2	3000	3200	.....	4450	.....
Brewster.....91	Own.	4-4 x5 1/2	125	32x4 1/2	17900	9000	.....	10500	.....	Northway.....Own.	6-31x5 1/2	128	33x5	4200	4200	6000	5600	5400	
Briscoe.....4-34	Own.	4-31x5	109	31x4	1285	1285	.....	1835	1885	Norwalk.....430-KS	Lyc.	4-31x5	116	32x3 1/2	.....	1285	.....	.....	.....
Brook.....S-21 A	Own.	2-31x3 1/2	90	28x3	395	.....	.....	.....	.....	Oakland.....34-C	Own.	6-21x4 1/2	115	32x4	1395	1395	.....	2065	2065
Buick.....21-44-S-6-7	Own.	6-31x4 1/2	118	33x4 1/2	1795	1795	.....	2585	2895	Ogren.....6-60	Own.	6-31x5 1/2	134	33x5	3850	3500	3900	5000	5100
Buick.....21-48-9-50	Own.	6-31x4 1/2	124	24x4 1/2	.....	.....	2065	2985	3295	Oldsmobile.....43-A	Own.	4-31x5 1/2	115	32x4	1445	1445	.....	2145	2145
Bush.....E.C.4	Lyc.	4-31x5	.....	.....	.....	1245	.....	.....	2050	Oldsmobile.....37A	Own.	6-21x4 1/2	112	32x4	1450	1450	.....	2145	2145
Bush.....E.C.6	Rut.	6-31x5	.....	.....	.....	1575	.....	.....	2150	Oldsmobile.....47	Own.	8-21x4 1/2	122	33x4 1/2	2100	2100	.....	3500	.....
Cadillac.....50	Own.	8-31x5 1/2	125	34x4 1/2	3790	3790	.....	4950	.....	Oldsmobile.....47	Own.	8-21x4 1/2	122	32x4	1695	.....	2395	2395	
Casa.....V	Cont.	6-31x5 1/2	126	34x4 1/2	.....	2650	3400	3750	.....	Overland.....4	Own.	4-31x5 1/2	100	30x3 1/2	895	895	.....	1425	1475
Chalmers.....6-30	Own.	6-31x4 1/2	117	32x4	1795	1795	1945	2595	2745	Packard.....Single-Six	Own.	6-31x5 1/2	116	33x4 1/2	2975	2975	.....	4150	4250
Chalmers.....6-30	Own.	6-31x4 1/2	122	33x4 1/2	.....	1945	.....	.....	.....	Packard.....Twin Six	Own.	12-3 x5	136	35x5	6000	6000	6000	8200	8450
Champion.....Tourist	Lycorn	4-31x5	113	32x3 1/2	1250	.....	.....	.....	.....	Paige.....6-42	Own.	6-31x5	119	32x4	1735	1795	.....	2600	2720
Champion.....Special	H-S.	4-31x5	118	32x4	1595	1595	.....	.....	.....	Paige.....6-66	Cont.	6-31x5	131	33x4 1/2	12995	.....	2895	3775	3850
Chandler.....Six	Own.	6-31x5	123	33x4	1930	1930	1930	2930	2930	Pan.....A	Own.	4-31x5	108	33x4	1500	.....	.....	.....	.....
Chrysler.....490	Own.	4-31x4	102	30x3 1/2	795	820	1325	1375	.....	Pan American E & F-6-55	H-S.	6-31x5	121	33x4	2250	2250	.....	.....	.....
Chevrolet.....FB	Own.	4-31x5 1/2	110	33x4	1320	1345	2075	2075	.....	Parenti.....1921	Own.	8-21x4 1/2	125	32x4	2000	.....	3000	.....	.....
Cleveland.....40	Own.	6-3 x4 1/2	112	32x4	1465	1465	2375	2475	.....	Peterson.....650	Cont.	6-31x4 1/2	120	32x4	1895	1925	2895	2895	.....
Climber Six.....S	H-S.	6-31x5	125 1/2	32x4 1/2	2750	2750	.....	.....	.....	Peerless.....56-S-7	Own.	8-31x5	125	34x4 1/2	2990	2990	3680	3950	.....
Cole.....870	Nort.	8-31x4 1/2	127	33x5	3250	3250	4250	4450	.....	Peters.....Own.	2-31x3 1/2	90	28x3	385	.....	.....	.....	.....	
Columbia.....D-C-53	Cont.	6-31x4 1/2	115	32x4	1945	1795	1995	2895	.....	Piedmont.....4-36	Lyc.	4-31x5	116	32x3 1/2	1485	.....	.....	.....	.....
Comet.....C-53	Cont.	6-31x5 1/2	125	33x4 1/2	.....	2450	.....	3650	.....	Piedmont.....6-40	Cont.	6-31x4 1/2	122	32x4	1945	.....	.....	.....	.....
Commonwealth.....44	H-S.	4-31x5	117	32x4	1595	.....	.....	2465	.....	Pierce-Arrow.....Own.	6-4 x5 1/2	138	35x5	8000	7500	7500	9000	9000	
Crawford.....L-63-65	Lyc.	4-31x5 1/2	122 1/2	32x4	3000	3000	.....	4500	.....	Pilot.....6-50	H-S.	6-31x5	126	32x4 1/2	2285	2285	.....	3600	3600
Crow-Elkhart.....S63-65	H-S.	6-31x5	117	33x4	1545	1545	.....	2395	.....	Porter.....40	Own.	4-4 6x6 1/2	142	35x5	6750	Chassi s Price	.....	.....	.....
Cunningham.....V-4	Own.	8-31x5	132	35x5	.....	.....	.....	.....	.....	Premier.....6-D	Own.	6-31x5 1/2	126 1/2	33x5	4600	14600	4600	5000	6100
Daniels.....D-19	Own.	8-31x5 1/2	132	34x4 1/2	5350	5350	6250	6950	.....	Premocor.....6-40 A	Falls	6-31x4 1/2	117	32x3 1/2	1295	.....	.....	.....	.....
Davis.....51-57	Cont.	6-31x4 1/2	120	33x4	1995	1895	2150	2795	2795	Premocor.....4-80	Dues.	4-4 x6	117	32x4 1/2	3865	.....	.....	.....	.....
Dispatch.....H-S-70	H-S.	4-31x5	112	32x4	1595	1595	.....	2570	2570	Raleigh.....A-6-60	H-S.	6-31x5	122	32x4 1/2	12750	2750	.....	3600	3700
Dodge Brothers.....6-80	Own.	4-31x5 1/2	114	32x3 1/2	1235	1285	1900	2150	.....	Ranger.....A-20	Own.	4-31x5	116	32x4	.....	2150	.....	2850	2955
Dorris.....17-A	D-Ly	4-31x5	108	31x4	1215	1215	1865	1995	.....	R & V Knight.....R	Own.	4-31x5	116	32x4	.....	2150	.....	2850	2955
Dupont.....A	Own.	4-31x5 1/2	124	32x4 1/2	3400	3400	.....	4900	.....	R & V Knight.....J	Own.	6-31x5 1/2	127	32x4 1/2	3350	3350	8350	4000	4200
Elcar.....7-R	Falls	6-31x4 1/2	117	33x4	1795	1795	1795	2600	.....	Reo.....T-6	Own.	6-31x5	120	33x4	1850	1850	2700	2750	.....
Elgin.....K-1	Own.	4-31x5	108 1/2	32x4	1595	1595	.....	2100	2450	Rever.....C	Dues.	4-31x6	131	32x4 1/2	4850	4650	4650	6500	.....
Essex.....Own.	4-31x5	108 1/2	32x4	1595	1595	.....	.....	.....	.....	Roamer.....6-54-E	Cont.	6-31x5 1/2	130	32x4 1/2	.....	.....	.....	.....	.....
Fergus.....S-5-21	Own.	31x5	126	32x4 1/2	.....	.....	.....	.....	.....	Rock Falls.....14000	Cont.	6-31x5 1/2	136	35x5	.....	.....	.....	.....	.....
Ferris.....T	Own.	4-31x4 1/2	100	30x3 1/2	395	440	745	795	.....	Rolls-Royce.....Own.	6-41x4 1/2	143 1/2	33x5	11,500	Chassi s Price	.....	.....	.....	
Ford.....9-B	Own.	6-31x4	115	32x4	2700	2900	2970	3850	.....	Saxon.....125	Own.	4-31x5	112	32x4	.....	1675	.....	2475	2475
Franklin.....Four	Own.	4-31x4 1/2	112	32x3 1/2	1285	1285	1985	2085	.....	Sayers Six.....DP	Cont.	6-31x4 1/2	118	33x4	2495	2195	.....	3295	.....
Globe.....B-10	Supre.	4-31x5	115	32x4	.....	.....	.....	.....	.....	Scripps-Booth.....B-39-42	Nort.	6-21x4 1/2	115	32x4	1545	1545	.....	2215	2295
Grant.....Sia	Own.	6-31x4 1/2	116	32x4	1550	1550	2450	2450	.....	Seneca.....L	LeR.	4-31x4 1/2	108	30x3 1/2	1185	1185	1185	.....	.....
Gardner.....G	Own.	4-31x5	112	32x3 1/2	1195	1195	.....	2145	.....	Severin.....Six	Cont.	6-31x5 1/2	122	33x4	1485	1485	.....	2100	2250
Halladay.....21	Rut.	6-31x5	116	33x4	.....	2285	.....	.....	.....	Severin.....Six	Cont.	6-31x5 1/2	122	33x4	1485	1485	.....	2100	2250
Handley-Knight.....Kn't	4-41x5 1/2	125	32x4 1/2	.....	2985	.....	4185	.....	.....	Sheridan.....4	Nort.	4-31x5 1/2	116	33x4	1685	1685	.....	.....	.....
Hanson Six.....60	Cont.	6-31x4 1/2	121	32x4	2185	2185	2285	3165	.....	Sheridan.....8	Nort.	8-31x4 1/2	132	33x5	.....	.....	.....	.....	.....
Hatfield.....A-42	H-S.	4-31x5	115	32x4	1695	1695	.....	2595	.....	Skelton.....35	Lyc.	4-31x5	112	32x3 1/2	1295	1295	.....	.....	.....
Haynes.....47	Own.	6-31x5	132	34x4 1/2	3500	2935	2935	4250	.....	Southern Six.....660-2	H-S.	31x5	127	32x4 1/2	.....	.....	.....	.....	.....
Haynes.....50	Own.	6-31x5	121	33x4	.....	1985	.....	.....	.....	Standard.....J	Own.	8-31x5	127	34x3 1/2	3400	3400	4500	4500	.....
Haynes.....48	Own.	12-21x5	132	31x4 1/2	4200	2635	3635	4950	.....	Stanley Steamer.....Own.	2-4 x5	190	34x4 1/2	.....	395				



## Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear								
Acason, R	1	\$2260	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Corbitt, D	1 1/2	2800	3 1/2 x 5	36x3 1/2	36x5	W	Gramm-Bern., 20	2	3175	4 1/2 x 5 1/2	36x4	36x7	W
Acason, RB	1 1/2	2485	3 1/2 x 5 1/2	36x3 1/2	36x6	W	Corbitt, C	2	3500	4 1/2 x 5 1/2	36x3 1/2	36x7	W	Gramm-Bern., 25	2 1/2	3575	4 1/2 x 5 1/2	36x4	36x4 1/2	W
Acason, H	2 1/2	3295	4 1/2 x 5 1/2	36x4	36x4 1/2	W	Corbitt, B	2 1/2	3650	4 1/2 x 5 1/2	36x4	36x7	W	Gramm-Bern., 35	3 1/2	4375	4 1/2 x 5 1/2	36x5	40x5 1/2	W
Acason, L	3 1/2	4295	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Corbitt, A	3 1/2	4500	4 1/2 x 5 1/2	36x5	36x10	W	Gramm-Bern., 50	5	\$5275	4 1/2 x 5 1/2	36x6	40x6 1/2	W
Acason, M	5	5250	5 x 6 1/2	36x6	40x12	W	Corbitt, AA	5	5500	4 1/2 x 6	36x6	40x6 1/2	W	Hahn, J4	1 1/2	.....	3 1/2 x 5	34x5	34x5	W
Ace, C	1 1/2	2750	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Cyclone	1 1/2	2800	3 1/2 x 5	34x3 1/2	34x6 1/2	W	Hahn, CD	2 1/2	.....	4 1/2 x 5 1/2	36x3 1/2	36x6	W
Ace, A	2 1/2	3450	4 1/2 x 5 1/2	36x4	36x7	W	Dart, S	1 1/2	.....	3 1/2 x 5 1/2	34x3 1/2	34x6	W	Hahn, EE	2 1/2	.....	4 1/2 x 5 1/2	36x4	36x8 1/2	W
Ace	3	3650	4 1/2 x 5 1/2	36x5	36x8	W	Dart, M	2 1/2	.....	4 1/2 x 5 1/2	36x4	36x7	W	Hahn, F	3 1/2	.....	4 1/2 x 5 1/2	36x5	36x10	W
Acme, B	1	2175	3 1/2 x 5	34x3 1/2	34x5	W	Dart, W	3 1/2	.....	4 1/2 x 6	36x5	36x10	W	Hahn, EF	5	.....	4 1/2 x 6	36x6	40x12	W
Acme, F	1 1/2	2475	3 1/2 x 5	34x3 1/2	34x5	W	Day-Elder, A	1	2225	3 1/2 x 5	34x3 1/2	34x4	W	Hal Fur, E	1	2350	4 x 5	35x5 1/2	35x7 1/2	W
Acme, A	2	3050	4 1/2 x 5 1/2	36x4	36x7	W	Day-Elder, B	1 1/2	2425	3 1/2 x 5	34x3 1/2	34x5	W	Hal Fur, B	2 1/2	3250	4 1/2 x 5 1/2	35x5	38x7	W
Acme, C	3 1/2	4050	4 1/2 x 5 1/2	36x5	40x10	W	Day-Elder, D	2	2900	4 1/2 x 5 1/2	36x4	36x7	W	Hal Fur, F	3 1/2	4250	4 1/2 x 5 1/2	36x6 1/2	40x10 1/2	W
Acme, E	5	5150	4 1/2 x 6	36x6	40x12	W	Day-Elder, C	2 1/2	3125	4 1/2 x 5 1/2	36x4	36x7	W	Hall	1 1/2	3100	3 1/2 x 5	34x5 1/2	38x7 1/2	W
Acme, G	5 1/2	1790	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Day-Elder, F	3 1/2	3950	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Hall	2 1/2	3275	4 1/2 x 5 1/2	36x4	36x6	W
Akr's Multi-Trk 20	1	.....	4 x 5 1/2	34x5	34x5	B	Day-Elder, E	5	4875	4 1/2 x 6	36x5	36x6 1/2	W	Hall	3 1/2	4100	4 1/2 x 5 1/2	36x5	36x5 1/2	W
All-Power, C	3 1/2	5800	4 1/2 x 6	36x7	36x10	W	Dearborn, F	1 1/2	2150	3 1/2 x 5 1/2	34x4	34x5	W	Hall	5	5100	4 1/2 x 5 1/2	36x5	40x6 1/2	W
All-American, B-1	1	1705	3 1/2 x 5	32x4	32x4	I	Dearborn, 48	2	2500	3 1/2 x 5 1/2	34x4 1/2	34x5 1/2	W	Hall	7	5100	4 1/2 x 5 1/2	36x5	40x6 1/2	C
All-American C-1	1 1/2	2195	3 1/2 x 5	34x4	34x5	I	Defiance, D	1 1/2	2550	3 1/2 x 5	35x5 1/2	38x7 1/2	I	Harvey, WEA	1 1/2	2550	4 1/2 x 5 1/2	34x3 1/2	34x5	W
American, 25	2 1/2	3575	4 x 6	36x4	36x4 1/2	W	Defiance, E	2	2750	3 1/2 x 5	35x5 1/2	38x7 1/2	I	Harvey, WFA	2 1/2	3300	4 1/2 x 5 1/2	36x4	36x7	W
American, 40	4	4575	4 1/2 x 6	36x5	36x5 1/2	W	DeKalb, E2 1/2	2 1/2	2250	4 1/2 x 5 1/2	34x3 1/2	36x5	W	Harvey, WHA	3 1/2	4300	4 1/2 x 6	36x5	36x5 1/2	W
Apex, G	1	1675	3 1/2 x 5	33x3 1/2	33x5 1/2	I	DeKalb, E2 1/2	2 1/2	2600	4 1/2 x 5 1/2	36x4	36x6	W	Harvey, WKA	5	5200	4 1/2 x 6	36x6	40x6 1/2	W
Apex, D	1 1/2	1915	3 1/2 x 5 1/2	34x3 1/2	34x4	I	DeMartini 1 1/2	1 1/2	2600	3 1/2 x 5	34x3 1/2	34x6	W	Hawkeye, K	1 1/2	2365	3 1/2 x 5 1/2	34x3 1/2	34x5	I
Apex, E	2 1/2	2695	4 1/2 x 5 1/2	36x4	36x7	I	DeMartini 2	2	3300	4 x 5 1/2	36x3 1/2	36x7	W	Hawkeye, M	2	2915	4 1/2 x 5 1/2	36x4	36x8	I
Apex, F	3 1/2	3975	4 1/2 x 6	36x5	36x10	I	DeMartini 3	3	4250	4 1/2 x 5 1/2	36x4	36x10	W	Hawkeye, N	3 1/2	4345	4 1/2 x 6	36x5	36x10	I
Armleder, HW	2 1/2	.....	4 1/2 x 5 1/2	36x4	36x7	I	DeMartini 4	4	4800	4 1/2 x 6	36x5	36x12	W	Hendrickson, K	5	4800	4 1/2 x 6	36x5	36x7	W
Armleder, KW	1	.....	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Demby, 33	1 1/2	2900	3 1/2 x 5	35x5 1/2	38x7 1/2	I	Hendrickson, J	2 1/2	3150	4 1/2 x 5 1/2	36x4	36x7	W
Armleder, 20	1 1/2	.....	4 1/2 x 5 1/2	34x3 1/2	34x5	W	Demby, 134	1	2800	3 1/2 x 5	36x3 1/2	36x6	I	Hendrickson, I	3 1/2	3975	4 1/2 x 5 1/2	36x5	36x5 1/2	W
Atco, B	1 1/2	.....	4 1/2 x 5 1/2	34x3 1/2	34x5	I	Demby, 25	3	3600	4 1/2 x 5 1/2	36x4	36x7	I	Highway, A10	4	.....	4 x 6	36x5	36x6 1/2	W
Atco, B1	1 1/2	.....	4 1/2 x 5 1/2	34x4 1/2	34x6 1/2	W	Demby, 27	4	4600	4 1/2 x 5 1/2	36x5	36x5 1/2	I	Highway, B510	5	.....	4 x 6	36x5	40x6 1/2	W
Atco, A	2 1/2	.....	4 1/2 x 5 1/2	36x4 1/2	36x8	W	Demby, 210	5	5350	4 1/2 x 5 1/2	36x6	40x6 1/2	I	Higraide, A17	3 1/2	1850	.....	.....	.....	W
Atlas, M.D.	1	.....	3 1/2 x 5	32x4 1/2	32x4 1/2	W	Dependable, A	1	1650	3 1/2 x 5	34x5	36x6	W	Higraide, A18	1	2100	3 1/2 x 5	35x5 1/2	35x7 1/2	W
Atterbury, 20R	1 1/2	2775	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Dependable, C	1 1/2	2350	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Higraide, B20	1 1/2	2500	4 1/2 x 5 1/2	35x4 1/2	36x6 1/2	W
Atterbury, 7CX	2 1/2	3375	4 1/2 x 5 1/2	36x4	36x4 1/2	W	Dependable, D	2	2650	4 x 5 1/2	34x5	36x6	W	Huffman, B	1 1/2	2075	3 1/2 x 5	34x3 1/2	34x6	W
Atterbury, 7D	3 1/2	4175	4 1/2 x 5 1/2	36x5	40x5 1/2	W	Dependable, E	2 1/2	2950	4 1/2 x 5 1/2	36x4	36x7	W	Huffman, C	1 1/2	1875	3 1/2 x 5 1/2	34x3 1/2	34x6	I
Atterbury, 8E	5	5575	4 1/2 x 6	36x5	40x6 1/2	W	Dependable, G	3 1/2	3550	4 1/2 x 6	36x6	38x7	W	Hurlburt	1 1/2	.....	4 x 5 1/2	34x4	34x5	W
Autocar, 21UF	2	2300	4 1/2 x 5 1/2	34x4	34x5	D	Diamond T, O	1 1/2	2500	3 1/2 x 5	36x5	36x6	W	Hurlburt	2 1/2	.....	4 1/2 x 5 1/2	36x4	36x4 1/2	W
Autocar, 21UG	2	2400	4 1/2 x 5 1/2	34x4	34x5	D	Diamond T, FS	1 1/2	2600	3 1/2 x 5	36x5	36x6	W	Hurlburt	3 1/2	.....	4 1/2 x 6	36x5	36x5 1/2	W
Autocar, 26Y	3 1/2	4350	4 1/2 x 5 1/2	34x5	36x10	D	Diamond T, T	2 1/2	2650	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Hurlburt	5	.....	4 1/2 x 6	36x5	40x6 1/2	W
Autocar, 26-B	3 1/2	4500	4 1/2 x 5 1/2	34x5	36x10	D	Diamond T, U	2	3285	4 x 5 1/2	36x4	36x7	W	Huron Eric	1 1/2	2425	3 1/2 x 5 1/2	36x3 1/2	36x5	I
Available, H1 1/2	1 1/2	2750	4 x 5 1/2	36x3 1/2	36x5	W	Diamond T, K	2 1/2	4075	4 1/2 x 5 1/2	36x5	36x5 1/2	W	Huron Mich.	2 1/2	2950	4 1/2 x 5 1/2	36x4	36x7	W
Available, H2 1/2	2 1/2	3475	4 x 5 1/2	36x4	36x8	W	Diamond T, EL	5	5400	4 1/2 x 5 1/2	36x6	40x6 1/2	W	Indep't (Iowa), G	1 1/2	2040	3 1/2 x 5 1/2	34x3 1/2	34x5	I
Available, H3 1/2	3 1/2	4475	4 1/2 x 5 1/2	36x5	40x5 1/2	W	Diamond T, S	5	5650	4 1/2 x 6	36x6	40x6 1/2	W	Indep't (Ia.), H.L.	2 1/2	2940	4 1/2 x 5 1/2	34x4	34x6	I
Available, H5	5	5375	4 1/2 x 6	36x6	40x12	W	Diehl, A	1	.....	3 1/2 x 5	34x4 1/2	35x5	I	Indep't (Iowa), B	1	1665	3 1/2 x 5	34x3 1/2	34x4	W
Available, H7	7	6000	5 x 6	36x6	40x14	B	Diehl, B	1 1/2	.....	3 1/2 x 5	36x5	36x6	I	Indep't (Ohio), F	1 1/2	2585	3 1/2 x 5	34x3 1/2	36x5	W
Avery	1	.....	3 x 4	34x5 1/2	34x5 1/2	I	Dispatch, F	1	1350	3 1/2 x 5	34x4 1/2	34x4 1/2	I	Indep't (Ohio), H	2 1/2	3285	4 1/2 x 5 1/2	36x4	36x4 1/2	W
Beck, A. Jr.	1	1800	3 1/2 x 5	34x3 1/2	34x4	I	Doane	2 1/2	.....	4 1/2 x 5 1/2	36x5	36x7	C	Indep't (Ohio), K	3 1/2	4285	4 1/2 x 5 1/2	36x5	36x5 1/2	W
Beck, C	2	2550	4 1/2 x																	



## Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear						Front	Rear	
Larrabee, W L.M.C., 2-20	5	5100	4 1/2 x 6	36x6	40x6d	W	Piedmont, 4-30	1 1/2	\$1685	3 1/2 x 5	34x4 1/2	34x4 1/2	W	Super Truck, 100	5	5300	4 1/2 x 6	36x5	40x12	W
Lone Star, 9	1	2540	4 1/2 x 5 1/2	36x4	36x4d	W	Pierce-Arrow	2	3750	4 1/2 x 5 1/2	36x4	36x4d	W	Super Truck, 150	7 1/2	6300	5 x 6	36x6	40x7d	W
Lueninghaus, K	1	\$2350	3 1/2 x 5 1/2	35x5 1/2	35x5 1/2	W	Pierce-Arrow	3 1/2	4950	4 1/2 x 6 1/2	36x5	36x5d	W	Texas, A38	3 1/2	1095	3 1/2 x 5	33x4	33x4	W
Lueninghaus, C	1	1545	3 1/2 x 5	32x3 1/2	32x4 1/2	W	Pierce-Arrow	5	5700	4 1/2 x 6 1/2	36x5	40x6d	W	Texas, TK39	1 1/2	1550	3 1/2 x 5	36x6	38x7	W
Mack, L	1 1/2	3150	4 1/2 x 5 1/2	36x4	36x7	W	Pioneer, 59	1	1650	3 1/2 x 4 1/2	32x4 1/2	32x4 1/2	W	Texas, TK	1 1/2	...	3 1/2 x 5	36x6	38x7 1/2	W
Mack, H	1 1/2	2100	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Pittsburgher, B	2 1/2	3500	4 1/2 x 5 1/2	36x5	36x7	W	Tiffin, F15	1 1/2	2695	4 1/2 x 5 1/2	36x3 1/2	36x5	W
Mack, M-2	3 1/2	2700	4 1/2 x 5 1/2	36x4	36x4d	W	Pony	1 1/2	400	2 1/2 x 4	28x3 1/2	28x3 1/2	C	Tiffin, F25	2 1/2	3580	4 1/2 x 5 1/2	36x4	36x3 1/2d	W
Mack, G	5	2925	4 1/2 x 5 1/2	36x4	36x6	W	Power, F	1 1/2	...	4 1/2 x 5 1/2	36x6	36x6	W	Tiffin, F35	3 1/2	4760	4 1/2 x 5 1/2	36x5	40x5d	W
MacDonald, A	15	3650	4 1/2 x 6	36x5	36x4d	W	Power, C	3 1/2	...	4 1/2 x 5 1/2	36x5	40x10	W	Tiffin, F50	5	5850	4 1/2 x 6	36x6	40x6d	W
Mack, AB D.R.	1 1/2	4500	4 1/2 x 6	36x5	36x5d	W	Premcar, B-143	1 1/2	2475	3 1/2 x 5	36x6 1/2	36x6 1/2	W	Tiffin, F60	6	6050	4 1/2 x 6	36x6	40x12	W
Mack, AB Chain	1 1/2	5500	4 1/2 x 6	36x5	40x6d	W	Rainier, R-11	3 1/2	2150	4 1/2 x 5 1/2	35x5 1/2	35x5 1/2	W	Titan, HT	3 1/2	4550	4 1/2 x 6	34x4	40x5d	W
Mack, AB D.R.	2	5750	4 1/2 x 6	40x7	40x14	D	Rainier, R-15	3 1/2	4500	4 1/2 x 5 1/2	36x5	36x5d	W	Titan, HD	6	5400	4 1/2 x 6	36x5	40x6d	I
Mack, AC Chain	3 1/2	3450	4 x 5	36x4	36x3 1/2d	D	Rainier, R-19	1	2350	4 1/2 x 5 1/2	34x3 1/2	31x4	W	Titan, TS	2 1/2	3400	4 1/2 x 5 1/2	34x4	36x4d	I
Mack, AC Chain	5	3000	4 x 5	36x4	36x4d	C	Rainier, R-16	1 1/2	2600	3 1/2 x 5	34x3 1/2	34x5	W	Tower, J	1 1/2	3000	4 1/2 x 5 1/2	35x5	38x7	W
Mack, AC Chain	6 1/2	3300	4 x 5	36x4	36x4d	D	Rainier, R-18	2	2950	4 1/2 x 5 1/2	34x4	34x6	W	Tower, H	2 1/2	3475	4 1/2 x 5 1/2	36x4	36x7	W
Mack, AC Chain	7 1/2	3750	4 x 5	36x4	36x4d	D	Rainier, R20	2 1/2	3650	4 1/2 x 5 1/2	34x4	34x7	W	Tower, G	3 1/2	4400	4 1/2 x 5 1/2	36x5	36x5d	W
Mack Trac, AB	5	4950	5 x 6	36x5	40x5d	C	Rainier, R17	5	5250	4 1/2 x 5 1/2	36x6	36x6d	W	Traffic, C	2	1595	3 1/2 x 5	34x3 1/2	34x5	I
Mack Trac, AC	7	5500	5 x 6	36x6	40x6d	C	Ranger, TK-20-2	2	...	3 1/2 x 5	36x6 1/2	36x6 1/2	W	Transport, 20	1	1850	3 1/2 x 5 1/2	34x3 1/2	34x4	I
Mack Trac, AC	10	5750	5 x 6	36x6	40x12	C	Reo, F	3 1/2-12	1385	4 1/2 x 5 1/2	34x4 1/2	34x4 1/2	B	Transport, 30	1 1/2	2250	3 1/2 x 5	34x5	36x5	I
Mack Trac, AC	13	6000	5 x 6	36x7	40x7d	C	Reliance, 10A	1 1/2	2500	4 x 5 1/2	36x3 1/2	36x5	I	Transport, 50	2 1/2	2785	4 1/2 x 5 1/2	36x4	36x7	I
Mapleleaf, AA**	2	3400	4 x 5	36x4	36x4d	C	Reliance, 20B	2 1/2	3200	4 1/2 x 5 1/2	36x4	36x4d	I	Transport, 70	3 1/2	4195	4 1/2 x 5 1/2	36x5	36x10	I
Mapleleaf, BB**	3	4950	5 x 6	36x5	40x5d	C	Republic, 10	1	1695	3 1/2 x 5	35x5 1/2	35x5 1/2	I	Traylor, B	1 1/2	2500	3 1/2 x 5 1/2	34x3 1/2	34x5	W
Mapleleaf, CC**	4	5500	5 x 6	36x6	40x6d	C	Republic, 10Exp.†	1	2095	...	35x5 1/2	35x5 1/2	I	Traylor, C	2	3000	4 x 5 1/2	36x4	36x7	W
Mapleleaf, DD**	5	5750	5 x 6	36x6	40x12	C	Republic, 11X	1 1/2	2295	3 1/2 x 5	34x3 1/2	34x5	I	Traylor, D	3	3500	4 1/2 x 5 1/2	36x4	36x8	W
Master, JW	1 1/2	6000	5 x 6	36x7	40x7d	C	Republic, 19	2 1/2	2795	4 1/2 x 5 1/2	36x4	36x7	I	Traylor, E	4	4700	4 1/2 x 6	35x5	40x10	W
Master, W	2 1/2	4150	4 x 5 1/2	34x4	36x6	W	Republic, 20	3 1/2	3895	4 1/2 x 5 1/2	36x5	36x10	I	Traylor, F	5	5100	4 1/2 x 6	36x6	40x6d	W
Master, D	2 1/2	4865	4 1/2 x 5 1/2	36x4	36x4d	W	Riker, BB	3	...	4 1/2 x 6	36x5	36x5d	W	Triangle, AA	1 1/2	1600	3 1/2 x 5	35x5 1/2	35x5 1/2	I
Master, A	3 1/2	5770	4 1/2 x 5 1/2	36x5	36x5d	W	Riker, CW	1 1/2	3000	4 1/2 x 6	36x5	36x6d	W	Triangle, A	2	2350	3 1/2 x 5 1/2	34x3 1/2	34x6	I
Master, E	3 1/2	7025	4 1/2 x 5 1/2	36x6	40x6d	W	Rowe, HW	4	4500	4 1/2 x 6	36x6	36x6d	W	Triangle, C	2 1/2	2700	4 x 5 1/2	36x4	36x7	I
Master, B	5	2690	4 1/2 x 5 1/2	34x3 1/2	34x5	W	Rowe, C. D. W.	2	3300	4 x 5	34x4	36x3 1/2d	W	Triangle, HB	2 1/2	2950	3 1/2 x 5 1/2	36x3 1/2	36x5	W
Master, F	5	3290	4 1/2 x 5 1/2	34x4	36x7	W	Rowe, G. S. W.	3	4150	4 x 6	34x5	36x5d	W	Triumph, HC	1 1/2	2550	3 1/2 x 5 1/2	36x3 1/2	36x5	W
Maxwell, 1 1/2	1 1/2	3540	4 1/2 x 5 1/2	34x4	36x7	D	Rowe, G. P. W.	3	5250	3 1/2 x 5 1/2	38x7 1/2	42x9 1/2	W	Triumph, G	1	1995	3 1/2 x 5 1/2	34x5 1/2	34x5 1/2	W
Menominee, HT	1	4190	4 1/2 x 6	36x5	40x5d	D	Rowe, F. W.	5	5500	4 1/2 x 6	36x6	40x6d	W	Twin City, B.W.	2	3000	4 x 5 1/2	36x4	36x7	I
Menominee, H	1 1/2	4040	4 1/2 x 6	35x5	40x5d	D	Rumely, A	1 1/2	2720	3 1/2 x 5 1/2	36x3 1/2	38x5	W	Twin City, A. W.	3 1/2	4400	4 1/2 x 6	36x5	40x5d	W
Menominee, D	2	5290	4 1/2 x 6 1/2	36x6	40x6d	D	Samsen, 15	1 1/2	...	...	32x4	32x4	B	Twin City, FWDB	3 1/2	4750	5 1/2 x 6	36x6	36x6	I
Menominee, G	3 1/2	5440	4 1/2 x 6 1/2	35x5	40x6d	D	Samsen, 25	1 1/2	...	...	35x5	35x5	B	Twin City, FWDB	5	5250	5 1/2 x 6	36x6 1/2	36x7	I
Menominee, J3	5	3740	4 1/2 x 5 1/2	34x4	36x4d	D	Sandow, G	1 1/2	2295	3 1/2 x 5	34x3 1/2	34x5	W	Ultimate, A	2	3200	4 x 5 1/2	36x3 1/2	36x5 1/2	W
Moline, 10	1 1/2	1332	3 1/2 x 4 1/2	32x3 1/2	32x4	W	Sandow, J	2 1/2	2590	3 1/2 x 5	34x4	34x6	W	Ultimate, AJ	2	3250	4 1/2 x 5 1/2	35x5 1/2	38x7 1/2	W
Moreland, 20N	1 1/2	2080	3 1/2 x 4 1/2	32x3 1/2	32x5	W	Sandow, M	3 1/2	3375	4 1/2 x 5 1/2	36x4	36x7	W	Ultimate, B	3	3750	4 1/2 x 5 1/2	36x4	36x4d	W
Moreland, 20B	1 1/2	3245	4 x 6	36x4	36x4d	W	Sandow, L	5	4295	4 1/2 x 5 1/2	36x5	36x5d	W	Ultimate, BL	3	3850	4 1/2 x 5 1/2	36x4	36x4d	W
Moreland, 20C	1 1/2	4270	4 1/2 x 6	36x5	36x5d	W	Sanford, 25	2 1/2	4975	4 1/2 x 5 1/2	36x6	40x6d	W	Union, F W	2 1/2	3490	4 x 6	36x5	36x8	D
Moreland, 20G	3 1/2	5450	4 1/2 x 6	36x6	40x6d	W	Sanford, 35	3 1/2	3350	4 1/2 x 5 1/2	36x4	36x4d	W	Union, H W	4	4485	4 1/2 x 6	36x6	40x12	D
Moreland, 20J	5	2450	3 1/2 x 5	34x5 1/2	36x6 1/2	I	Sanford, 50	5	4200	4 1/2 x 5 1/2	36x5	36x5d	W	Union, J W	6	5800	5 x 6	36x6	40x14	D
Mutual, 2B	2 1/2	2850	3 1/2 x 5	34x5 1/2	36x6 1/2	I	Schacht, 2-Ton	2	3550	4 1/2 x 5 1/2	36x4	36x7	W	United, A	1 1/2	2445	3 1/2 x 5 1/2	36x3 1/2	34x5	I
Mutual, 2BP	2 1/2	3125	4 1/2 x 5 1/2	36x3 1/2	36x6	W	Schacht, 2 1/2-Ton	2 1/2	3850	4 1/2 x 5 1/2	36x4	36x4d	W	United, B	2 1/2	3150	4 1/2 x 5 1/2	36x4	36x7	I
Napoleon, 7	1 1/2	3900	4 1/2 x 5 1/2	36x4	36x8	W	Schacht, 3 1/2-Ton	3 1/2	4350	4 1/2 x 6	36x5	36x5d	W	United, C	2 1/2	3975	4 1/2 x 5 1/2	36x5	36x5d	I
Napoleon, 7	1 1/2	4975	4 1/2 x 6	36x5	40x5d	W	Schacht, 5-Ton	5	5358	4 1/2 x 6	36x5	40x6d	W	United, V	5	5100	4 1/2 x 6	36x6	40x6d	I



# Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
All-In One...	12-25	\$1975	3	Weid.	4-3 1/2 x 5 1/2	GDK	2-3	G-O.....G	14-28	\$1485	4	Wauk.	4-4 1/2 x 5 3/4	GorK	3	Prairie Dog..L	9-18	670	3	Wauk	4-3 1/2 x 5 1/4	Gas.	2
Allis-Chalm..B	6-12	925	2	LeR.	4-3 1/2 x 4 1/2	Gas.	1-2	Grain Belt..A	18-36	2150	4	Wauk	4-4 1/2 x 6 3/4	GorK	4	Prairie Dog..D	15-30	1250	4	Wauk	4-4 1/2 x 6 1/4	Gas.	3
Allis-Chal.G.P	6-12	850	2	Mid.W	4-4 1/2 x 5 1/4	Gas.	2-3	Gray.....1920	18-36	1836	3	Wauk	4-4 1/2 x 6 3/4	Gas.	4	Ranger Cul.	8-16	TK-20	4	Leit.	4-3 1/2 x 4 1/2	Gas.	1
Allis-Chalm..	12-20	1495	4	Own	4-4 1/2 x 5 1/4	GorK	3-4	Ground Hog	19-31	2000	4	Erd.	4-4 x 6	GorK	3	Reed.....	15-30	2750	4	Dom	4-4 1/2 x 6	K.	3-4
Allis-Chalm..	18-30	2150	4	Own	4-4 1/2 x 5 1/4	G.K	4	Gt. Western St	20-30	1950	4	Beav.	4 1/2 x 6	K.	4	Reed.....A-1	18-36	2400	4	Dom	4-5 x 6	Gas.	3-4
Allwork.....2-G	10-18	875	4	Own	4-4 1/2 x 6	G.K	4	Hart-Parr..20	-20	1105	4	Own	2-5 1/2 x 6 1/2	K.D	3	Reliable.....	10-20	985	4	Own	2-6 x 7	Ker.	2
Allwork.....C	14-28	2500	4	Own	4-5 x 6	GorK	3	Hart-Parr..30	15-30	1595	4	Own	2-6 1/2 x 7	K.D	3	Reed.....	12-25	1600	4	Wauk	4-4 1/2 x 5 1/4	GorK	3
AndrewKin.D	18-36	2500	4	Clim.	4-5 x 6 1/2	GorK	4	Heider.....D	9-16	916	4	Wauk	4-4 1/2 x 5 3/4	G.K	2	Russell.....	12-24	985	4	Own	4-4 1/2 x 5 1/4	GorK	2-3
Ane.....A	3-5	500	4	Own	1-4 1/2 x 5	Gas.	2-3	Heider.....C	12-20	1200	4	Wauk	4-4 1/2 x 6 3/4	G.K	3	Russell.....	15-30	1600	4	Own	4-5 x 6 1/2	GorK	3-4
Appleton.....	12-20	1500	4	Own	4-4 1/2 x 5 1/4	G.K	2-3	Heider.....Cult	6-10	610	4	LeR.	4-3 1/2 x 4 1/2	G.K	1	Russell.....	20-35	2035	4	Own	4-5 1/2 x 7	GorK	4-5
Aultman-T....	15-30	1500	4	Clim.	4-5 x 6 1/2	G.K	4	Hicks.....	20-30	2030	4	Wauk	4-4 1/2 x 6	KorG	3	Russell.....	30-60	3060	4	Own	4-8 x 10	GorK	8-10
Aultman-T....	22-45	2245	4	Own	4-5 1/2 x 8	G.K	6	Huber Light 4	12-25	2500	4	Wauk	4-4 1/2 x 5 3/4	GorK	3	Samsen.....M	2	995	4	Nov.	4-4 x 5 1/2	G.K	2
Aultman-T....	30-60	3060	4	Own	4-7 x 9	G.K,D	8	Huber Super 4	15-30	1885	*2	Midw.	4-4 1/2 x 6	Gas.	3	Sandusky.....J	10-20	1250	4	Own	4-4 1/2 x 5 1/4	G.K,D	2
Automot..B-3.	12-24	1785	4	Here'l	4-4 x 5 1/2	Gas.	2-3	Illinois.....C	18-36	2500	4	Clim.	4-5 x 6 1/2	G.K	4	Sandusky.....E	15-35	1750	4	Own	4-5 x 6 1/2	G.K,D	4
Avery..SR..Cul	5-10	510	4	Own	4-3 x 4	G.K	2	Imperial....E	40-70	5000	4	Own	4-7 1/2 x 9	G,K,D	10	Shawnee Com.	6-12	385	2	LeR.	4-3 1/2 x 4 1/2	Gas.	10
Avery.....Cult-C	5-10	510	4	Own	4-3 x 4	G.K	2	Indiana.....F	5-10	510	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Shawnee Com.	9-18	918	2	Gray	4-3 1/2 x 5	GorK	2-3
Avery.....B	8-16	816	4	Own	4-3 x 4	G.K	2	International	8-16	1000	4	Own	4-4 1/2 x 5	G,K,D	2	Shelby.....C	10-20	1020	4	Erd.	4-4 x 6	GorK	2-3
Avery.....	12-25	1225	4	Own	2-5 1/2 x 6	G,K,D	2-3	International	15-30	1950	4	Own	4-5 1/2 x 8	G,K,D	4	Shelby.....D	15-30	1530	4	Beav.	4-4 1/2 x 6	G.K	3
Avery.....	14-28	1428	4	Own	2-6 1/2 x 7	G,K,D	3-4	J-T.....N	20-40	3485	*2	.....	4-4 1/2 x 6	G,K	3-4	Short Turn..	20-40	1500	3	.....	4-4 1/2 x 6	G,K	3
Avery.....	18-36	1836	4	Own	4-4 1/2 x 7	G,K,D	4-5	Keck-Gon....	15-30	1650	4	Own	2-7 1/2 x 8	G,K	3	Square T....A	18-35	2075	3	Clim.	4-5 x 6 1/2	G,K	3
Avery.....	25-50	2550	4	Own	4-6 1/2 x 7	G,H,D	5-6	Klumb.....F	16-32	1632	4	Clim.	4-5 x 6 1/2	.....	.....	Steady Pull..	12-23	1485	4	Beav.	4-4 x 5	Gas.	3
Avery.....	45-65	4565	4	Own	4-7 1/2 x 8	G,K,D	8-10	LaCrosse...M	7-12	900	4	Own	2-4 x 6	G,K	1	Stinson.....4E	18-36	1935	4	Beav.	4-4 1/2 x 6	G,K	4
Bates All St...	15-25	1525	4	Own	4-4 1/2 x 6	Ker.	3	LaCrosse...G	12-24	1250	4	Own	2-6 x 7	GorK	3	Stone.....	20-40	2040	4	Beav.	4-4 1/2 x 6	G,K	4
Bates.....S.M.	15-22	1522	*4	Own	4-4 1/2 x 6	G,K,D	3	LaCrosse...G	12-24	1250	4	Own	2-6 x 7	GorK	3	Tioga.....3	15-27	2625	4	Wisc.	4-4 1/2 x 6	Gas.	3-4
Bates Mule..F	18-25	1825	*2	Midw	4-4 1/2 x 6 1/4	Gas.	3	Lauson.....	12-25	1495	4	Midw.	4-4 1/2 x 5 1/4	Gas.	3	Titan.....	10-20	1000	4	Own	2-6 1/2 x 8	G,K,D	3
Bates Mule..H	15-25	1525	4	Midw	4-4 1/2 x 6 1/4	Gas.	3	Lauson.....	15-30	1885	4	Beav.	4-4 1/2 x 6	GorK	3-4	Tillermoe...A	2-6	385	2	Vur.	1-4 x 4	G.K	1
Bates Mule..G	25-35	2535	*2	Midw	4-4 1/2 x 6 1/4	Gas.	com.	Lauson.....21	15-30	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Topp.....B	30-45	4000	4	Wauk	4-4 1/2 x 6 1/4	Gas.	3-4
Beane.....	8-16	816	*1	Own	14-3 1/2 x 4	G,K	2-3	Leader.....B	12-18	1095	4	Own	2-6 x 6 1/4	G,K,D	2-3	Toro Tractor	6-12	950	4	LeR.	4-3 1/2 x 4 1/2	Gas.	2
Beeman.....G	2-4	340	4	Own	1-3 1/2 x 3 1/2	G,K,D	1 1/2	Leader.....C	18-36	2650	2	Clim.	4-5 x 7 1/2	Ker	3-4	Townsend...	10-20	1020	2	Own	4-6 1/2 x 7	Ker	2-3
Best.....30	20-30	2030	*2	Own	4-4 1/2 x 6 1/4	G,K,D	4	Leader.....N	16-32	1985	4	Clim.	4-5 x 6 1/2	G,K	3-4	Townsend...	15-30	1530	2	Own	4-7 x 8	Ker	3-4
Best.....60	35-60	3560	*2	Own	4-6 1/2 x 8	G,K,D	8-10	Leader.....GU	18-35	2775	4	Clim.	4-5 x 6 1/2	G,K	3-4	Townsend...	25-50	2550	2	Own	4-8 1/2 x 10	Ker	4-8
Boring.....1921	1850	1850	3	Wauk	4-4 1/2 x 6 1/4	GorK	2	Leonard....E	20-30	2530	4	Buda	4-4 1/2 x 6	G,K	3	Traylor.....TB	6-12	815	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1
Bull.....	12-24	1200	3	Toro	2-5 1/2 x 7	G,K	3	Liberty.....	18-32	2475	4	Clim.	4-5 x 6 1/2	G,K	4	Triumph....H	18-36	2450	2	Erd.	4-1 1/2 x 6	Ker.	4
Burn-Oil....	15-30	1650	4	Own	2-6 1/2 x 7	Ker.	3	Little Bear..	4	850	4	Ford	4-3 1/2 x 4	Gas.	.....	Trundaar...10	25-40	4250	*2	Wauk	4-4 1/2 x 6 1/4	GorK	4
Capital.....	15-30	1000	2	Own	4-4 1/2 x 6	Gas.	33	Little Giant..B	16-22	2200	4	.....	4-4 1/2 x 5	K.	4	Turner.....1921	14-25	1295	4	Buda	4-4 1/2 x 5 1/2	G,K	3
Case.....	10-18	1250	4	Own	4-4 1/2 x 6	GorK	2	Little Giant..A	26-35	3300	4	.....	4-5 1/2 x 6	K.	6	Twin City...	12-20	1220	4	Own	4-4 1/2 x 6 1/4	G,K	3
Case.....	15-27	1865	4	Own	4-4 1/2 x 6	GorK	3	Lombard.....	26-35	3300	4	*2	6-5 1/2 x 6 3/4	G,K	16	Twin City...	20-35	2035	4	Own	4-5 1/2 x 6 1/4	G,K	5
Case.....	22-40	3350	4	Own	4-5 1/2 x 6 3/4	GorK	4-5	Motor Macult.	1 1/2	225	2	Own	1-2 1/2 x 3 1/2	Gas.	.....	Twin City...	40-65	4065	4	Own	4-7 1/2 x 10	G,K	8
Caterpillar T11	25	25	*2	Own	4-4 1/2 x 6	Gas.	4	Magnet.....B	14-28	1875	4	Wauk	4-4 1/2 x 6 1/4	K&G	3	Uncle Sam C20	12-20	1385	4	Wid	4-4 x 5 1/2	GorK	2-3
Caterpillar T16	40	40	*2	Own	4-4 1/2 x 6	Gas.	6	Market.....	2-4 1/2	241 1/2	4	Vur.	1-4 x 4	Gas.	.....	Uncle Sam B19	20-30	2300	4	Beav.	4-4 1/2 x 6	GorK	3-4
Chase.....	12-25	1225	3	Buda	4-4 1/2 x 6 1/4	GorK	2-3	Mastis Jr....	5-10	585	2	LeR.	2-3 1/2 x 4	Gas.	1	Uncle Sam D21	20-30	2075	4	Beav.	4-4 1/2 x 6 1/4	GorK	3-4
Cletrac.....W	12-20	1495	*2	Own	4-4 x 5 1/2	G,K,D	2-3	Merry Gar1921	2	230	2	Evin	1-2 1/2 x 2 1/2	Gas.	.....	Universal....	1-4	475	2	Own	1-3 1/2 x 5	G	1
Dakota.....A	15-27	1750	3	Dom.	4-4 1/2 x 6	Gas.	3	Minne..All-P	12-25	1325	4	Own	4-4 1/2 x 7	GorK	3	Utilitor.....501	2 1/2-4	380	4	Own	1-3 1/2 x 4 1/2	G	5-6
Dart.....B.J.	15-30	1530	4	.....	4-4 1/2 x 6	Gas.	3-4	Mohawk.....1921	8-16	785	4	Light	4-3 1/2 x 4 1/2	KorG	1-2	Velie..Biltwell	12-24	1750	4	Own	4-4 1/2 x 5 1/4	G,K,D	3
Depue.....A	20-30	2500	4	Buda	4-4 1/2 x 6	Gas.	4	Moline Univ D	9-18	1075	2	Own	4-3 1/2 x 5	Gas.	2	Victory.....1921	9-18	1350	4	Gray.	4-3 1/2 x 5	Gas.	2
Dill.....D	20	2480	4	Cont.	4-4 1/2 x 5 1/2	Gas.	3	Moline Orch.	9-18	1075	2	Own	4-3 1/2 x 5	Gas.	2-3	Victory.....1921	15-30	1750	4	Wauk	4-4 1/2 x 5 1/4	Gas.	3
Do-it-All....	4-6	595	.....	Own	1-4 1/2 x 5	Gas.	5-6	Monarch B...	30-20	3400	*2	Beav.	4-4 1/2 x 6	GorK	3-4	Vim.....B	15-30	1650	4	Wauk	4-4 1/2 x 5 1/4	G,K	3
Eagle.....F	12-22	1390	4	Own	2-7 x 8	GorK	3-4	Motox.....	15-30	2250	4	Buda	4-4 1/2 x 6	Gas.	3-4	Wallis.....K	15-25	1600	4	Own	4-4 1/2 x 5 1/4	G,K	3
Eagle.....F	16-30	1850	4	Own	2-8 x 8	GorK	4-5	New Britain..1	3-6	425	4	Own	2-3 1/2 x 4	Gas.	1 1/2	Waterloo...N	12-25	1225	4	Own	2-6 1/2 x 7	G,K	3
E-B.....Q	12-20	1220	4	Own	4-4 1/2 x 5	GorK	4	New Britain..2	3-6	425	4	Own	2-2 1/2 x 4	Gas.	1 1/2	Webfoot....40	25-40	4000	.....	.....	4-5 1/2 x 7	G,D	6
E-B.....Q	12-20	1220	4	Own	4-4 1/2 x 5	GorK	4	Nichols-Shep.	20-42	3100	.....	Own	8 x 10	GorK	3-6	Webfoot....53	28-53	5250	*2	Wisc.	4-5 1/2 x 7	G,D	6
E-B.....Q	16-32	1632	4	Own	4-5 1/2 x 7	GorK	4	Nichols-Shep.	20-42	3100	.....	Own	8 x 10	GorK	3-6	Wellington..B	12-22	1222	4	Erd.	4-4 x 6	Ker.	2-3
E-BReeves...	40-65	4065	4	Own	4-7 1/2 x 9	GorK	8-10	Nichols-Shep.	25-50	3460	.....	Own	9 x 12	GorK	4-7	Wellington..F	16-30	1630	4	Chief	4-4 1/2 x 6	Ker.	3-4
Evans.....	18-30	2000	4	Buda	4-4 1/2 x 6	G,K	3	Nilson Senior	20-40	2675	5	Wauk	4-5 x 6 1/4	G,K	4	Wetmore....	12-25	1650	4	Wauk	4-4 x 5 1/2	Gas.	2-3
Fageol.....D	9-12	1525	4	Lye.	4-3 1/2 x 5	Gas.	2	Oil Pull....K	12-20	1785	4	Own	2-6 x 8	K,D	3	Whitney....T	9-18	1175	4	Own	2-5 1/2 x 6 1/4	Gas.	2
Farm Horse...	18-30	1885	4	Clim.	4-5 x 6 1/2	G,K	3-4	Oil Pull....H	16-30	2665	4	Own	2-7 x 8 1/2	K,D	3	Wichita....T	15-30	2500	4	Beav.	4-4 1/2 x 6	G,K,D	3-4
Farquhar...	15-25	1525	4	Buda	4-4 1/2 x 6	G,K,D	3-4	Oil Pull....G	20-40	3750	4	Own	2-8 x 10	K,D	5-6	Wisconsin...E	16-30						

# COMING MOTOR EVENTS

## AUTOMOBILE SHOWS

Chattanooga, Tenn.	Annual Automobile Show	April
Dallas, Tex.	Automobile Show	April 11-16
Buffalo	First Annual Motors and Sportsmen's Show	April 11-16
Oklahoma City	Annual Automobile Show	April 11-16
Charlotte, N. C.	Carolinas Automobile Show	April 11-16
Red Bank, N. J.	Annual Automobile Show	April 16-23
Goldsboro, N. C.	Automobile and Industrial	April 20-23
Mexico City	Automobile Show	April 20-May 5
Waynesburg, Pa.	Automobile Show	April 21-24
Lincoln, Ill.	Automobile Show	April 21-29
Chicago	Used Automobile Show	May 7-15

Bangor, Me. Automobile Show May 9-14

## RACES

Indianapolis Spwy	500 Mile Race	May 30
Uniontown Spwy.		June 18
Cincinnati	Speedway Race (Possible)	July 4
Tacoma	Speedway Race	July 4
Le Mans	French Grand Prix	July 25
Elgin	Road Race (Possible)	August 3
Pikes Peak	Hill Climb	September 5
Uniontown Spwy.	Annual Autumn Classic	September 5
Los Angeles	Speedway Race	November 24

## Business Notes

Timken-Detroit Axle Co. announces a total surplus of \$17,920,062.16 and net profits for 1920 of \$712,508.87 in its report as of Dec. 31. Total assets were \$21,949,863.39 including \$671,150.38 in cash and inventories of \$10,932,521.39. Land, building and equipment account is given as \$8,257,232.52. Current liabilities were \$3,574,801.23 including \$3,000,000 due in bank notes and \$587,480.15 in accounts payable.

The Kaskaskia Garage, also known as the Cadillac Auto Co., conducted at La Salle, Ill., by Leonard Travis and Charles B. Smith has been incorporated under the name Travis-Smith Motor & Supply Co., the change being effective April 1.

The Miles Piston Ring Sales Co. has opened a distributing office at 437 Fifth avenue, New York City. The company is a subsidiary of the North American Truck Co., Inc., of which George B. Godfrey is manager. The Miles company is organized for the purpose of distributing the Miles one-piece triple seal piston rings in New York state and New Jersey. Irving Miller is in charge of sales of piston rings.

Frank B. Wood, former manager of the Detroit branch of the Van Sicklen Speedometer Corp., has been appointed manager of the Philadelphia branch of the Dorris Motor Co.

Robert H. Campbell, second vice-president and purchasing agent of the Comet Automobile Co., Decatur, Ill., has resigned, to become president of the National Axle Co., Indianapolis.

The Edward Valve & Mfg. Co., in order to centralize control of its industry, promote economy and better serve its customers, has moved its general offices from Chicago to its factory located at East Chicago, Ind.

Waring Sherwood has resigned as advertising manager of the Briscoe Motor Corp., effective May 1. He has not announced his future plans.

D. Minard Shaw has been appointed Mr. Sherwood's successor.

George H. Thrall, general manager of the Thrall Motor Car Co., Hartford, Conn., has resigned to join the sales force of the Hartford Packard branch. The Thrall company will discontinue business and is now winding up its affairs.

The Code Mfg. Co., Chicago, has been incorporated under the laws of Illinois to manufacture ratchet wrenches, visors and oilers. The company has been in production for the last six months. J. R. Oyot is president; William E. Code, vice-president, and A. L. Rousseau, general manager.

The American Pneumatic Equipment Corp. has been organized in Dallas, Texas, to make and sell automatic air springs for automobiles. F. E. Poindexter is president and J. C. Colt, secretary-treasurer.

T. M. Andrews has been appointed New England manager of the Hassler Shock Absorber Co. of Indianapolis with headquarters in Boston.

John R. Powers, for the past eight years in the tire business in Boston, the last two years with the Globe Rubber Tire Mfg. Co., has been made the manager of the Globe's Boston branch.

Woodbridge Co., Inc., representing the Denby line of trucks, with a place of business at 374 Newbury street, Boston, have been petitioned into bankruptcy in the United States district court at the instance of three creditors with total claims of \$88,750.

R. B. Greene has been appointed retail sales manager at the Boston branch of the Winton Co., of which F. W. Stockbridge is manager.

Max Leitman has been appointed New England distributor of the Achilles Tire Co. of Birmingham, N. Y. He has signed up sub-agents in all the larger cities in the territory.

G. A. Pulsifer has been appointed general retail sales manager of the Kenworthy Motors of

New England. He was formerly sales manager of the R. & V. Knight Co. of New England. Fred E. Graves has resigned as president of the latter company.

L. K. Obdyke, for the last four years identified with the Buick sales agency in Cleveland, has been made manager of sales for the Paige organization in that city.

Michael Hoffman and Joseph Schultz have organized the H. & S. Auto Accessories Co., Cleveland, for the distribution in northern Ohio of the McNercy air braking system for passenger and commercial cars.

The United Automotive Body Co. has moved its executive offices from Springboro, Pa., to Cleveland because of the latter's central location, its relation to the automotive trade and its transportation facilities.

F. H. Hersch, for the last six and a half years associated with the Kelly-Springfield Tire Co., has resigned as district manager of the company with headquarters in San Francisco.

The Auto Specialties Mfg. Co., St. Joseph, Mich., has acquired all patent and manufacturing rights on the shock absorbers for Ford cars formerly known under the name "Burgess" and after making some minor improvements will bring them out under the trade name "Drednaut."

E. S. Beggs at Long Beach, Calif., has been made sales manager of the Planet Mfg. Co. of Detroit, manufacturers of a carburetor attachment.

L. L. Evans, for several years with the Firestone Tire & Rubber Co. in Philadelphia, has been appointed manager of truck tire sales, succeeding William E. Duck, who is leaving for England early this month, to assume charge of the company's London branch.

M. D. Clements has been appointed manager of the Packard Motor Car Co.'s branch in Bethlehem, Pa. He succeeds J. Pierce Guyer, who has resigned to devote his attention to other business interests.

C. G. Van Vliet, for many years one of the managers of the Des Moines show and who recently was elected chairman of the Motor Trade Bureau of the Des Moines Chamber of Commerce, has been compelled to resign his position on account of ill health. C. F. Claiborne has been elected chairman to succeed Mr. Van Vliet and D. S. Kruidenier has been chosen vice chairman.

George T. Briggs, formerly in advertising and sales capacities with the Wheeler-Schebler Carburetor Corp. and the Sinclair Consolidated Oil Corp., has been made general manager of the Motorcycle and Allied Trades Association with headquarters at 326 West Madison street, Chicago. The association has under way a "Do It with a Motorcycle Campaign," which includes national publicity in a number of mediums.

E. W. Allen, former district representative of the Maxwell Motor Sales Corp. in the south, has severed his connection with the B & B Motor Co., distributor of Maxwell cars and trucks in North and South Carolina, as district representative to become associated with the Chas. W. Tway Motor Co. of Atlanta, Ga., in the capacity of special representative. The Tway company distributes Haynes cars in eleven southern states.

Le Roy Kramer, for some months vice-president in charge of production at the Willys-Overland plant in Toledo, has gone to Buffalo where he will take up similar duties with the Pierce-Arrow Motor Car Co.

J. J. Moriarity has been appointed factory manager of the Victor Rubber Co., filling the vacancy caused by the resignation of Frank R. Talbott.

## New Canadian Officers.



These are the officers of the Ontario Retail Automotive Dealers' section of the Retail Merchants' Association of Canada elected for the current year at the recent fourth annual convention in Toronto. The president is A. J. Duffus of Peterboro who has his hand shielding his face from the sun